

CTO

THE MAGAZINE FOR INFORMATION EXECUTIVES

JULY 1993

VOLUME SIX NUMBER FIFTEEN

SEVEN DOLLARS

COVER STORY

Workgroup Dynamics

*How Organizations
Are Learning To Share*

ALSO INSIDE

Rating Dispersed IS:

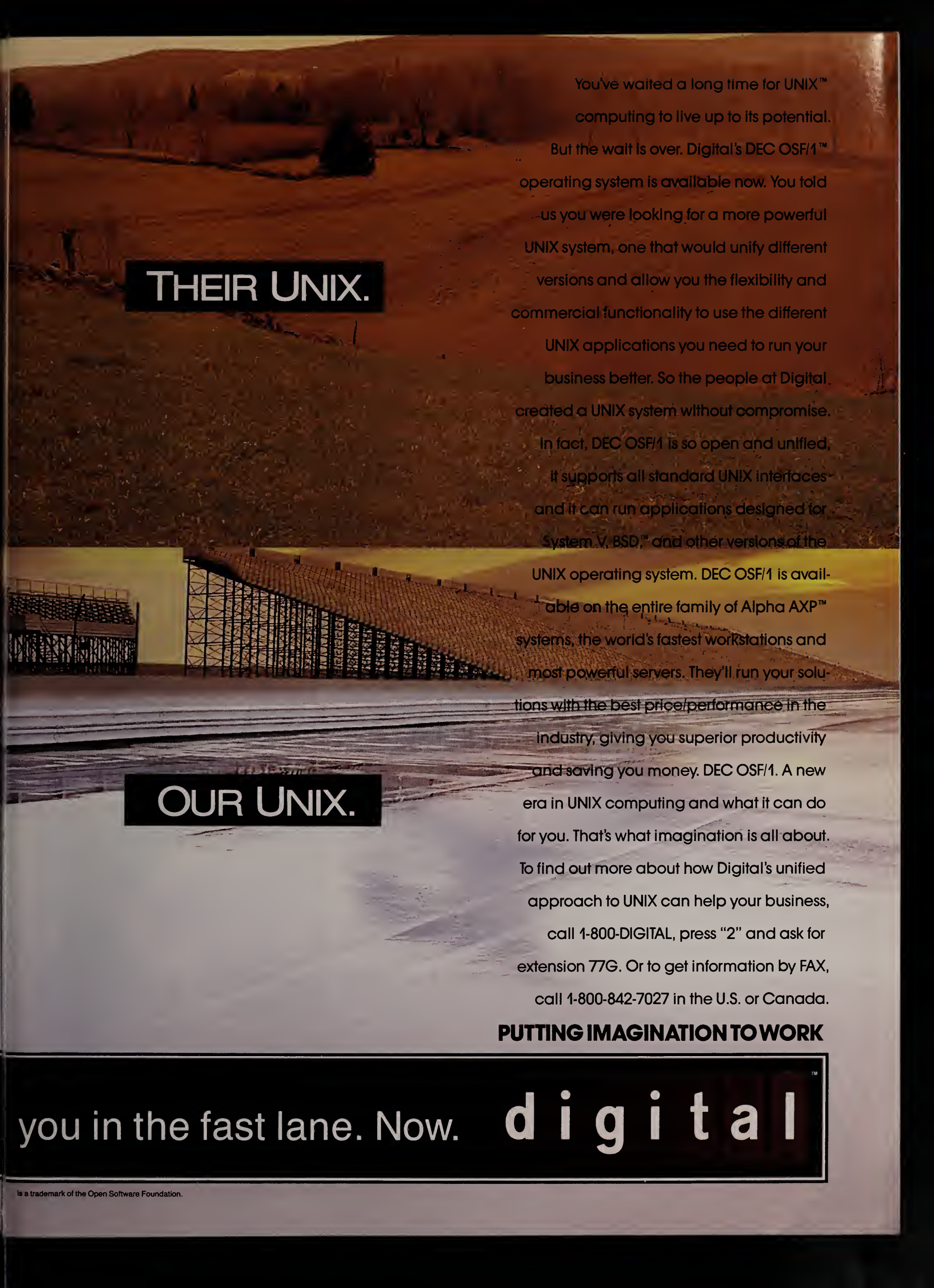
*Are The Users
Having Fun Yet?*

AN INTERNATIONAL DATA GROUP PUBLICATION

McKinsey & Co.'s
Hans-Dieter Bluhm (left)
and Brook Manville



i magine a supercharged UNIX that puts y



THEIR UNIX.

OUR UNIX.

You've waited a long time for UNIX™ computing to live up to its potential. But the wait is over. Digital's DEC OSF/1™ operating system is available now. You told us you were looking for a more powerful UNIX system, one that would unify different versions and allow you the flexibility and commercial functionality to use the different UNIX applications you need to run your business better. So the people at Digital created a UNIX system without compromise. In fact, DEC OSF/1 is so open and unified, it supports all standard UNIX interfaces and it can run applications designed for System V, BSD,™ and other versions of the UNIX operating system. DEC OSF/1 is available on the entire family of Alpha AXP™ systems, the world's fastest workstations and most powerful servers. They'll run your solutions with the best price/performance in the industry, giving you superior productivity and saving you money. DEC OSF/1. A new era in UNIX computing and what it can do for you. That's what imagination is all about. To find out more about how Digital's unified approach to UNIX can help your business, call 1-800-DIGITAL, press "2" and ask for extension 77G. Or to get information by FAX, call 1-800-842-7027 in the U.S. or Canada.

PUTTING IMAGINATION TO WORK

you in the fast lane. Now.

digital™

errors
absolute chaos
lost data • angry users
loss of control • user rebellion
redundant procedures • manual errors
furious bosses • system failures • corrupted data
sleepless nights • backup disasters • security breaches

WARNING!

It Can Be Extremely Dangerous To Attempt
To Manage Any Environment Without
The Industry's Leading
Systems Software:
CA-UNICENTER.

Why take a chance?

Especially when there's a proven, industrial-strength software solution that can solve all your problems.

Introducing CA-UNICENTER®. The industry's leading systems software from the world's leading systems software company. It gives you absolute control over absolutely everything: security, storage and backups, production, performance monitoring, charge back, you name it.



For Information On Free Seminars And
Demo Disks Call 1-800 CALL CAI Ext. 145.
See how easy it is to take all
the risk out of systems
management. Call today.
Better yet, call right now.

**COMPUTER
ASSOCIATES**
Software superior by design.

PLAY IT SAFE WITH CA-UNICENTER®

UNIX NETWORK OS/2 MVS VSE NT VMS

© Computer Associates International, Inc., One Computer Associates Plaza, Islandia, NY 11788
7000. All product names referenced herein are trademarks of their respective companies.

CIO

VOLUME 6, NUMBER 15



Share and share different 38
Cover photo by Kent Hanson

COVER STORY

Learning to Share

38

What should the goal of workgroup computing be: enhanced communication or true collaboration? Two big-name consultants with distinct cultures implemented the same workgroup tool and produced very different answers.

By Thomas Kiely

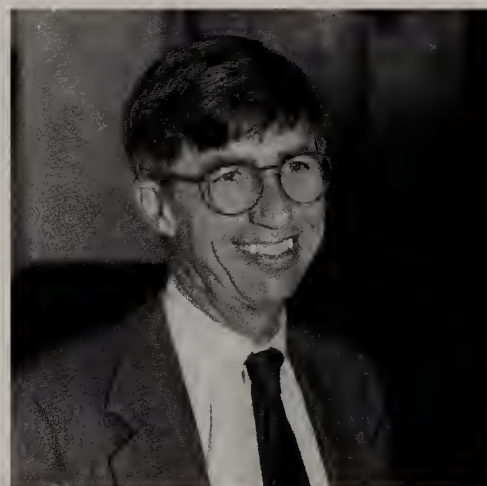
FEATURES

Divide and Conquer

28

Once considered viable only for scientific and engineering applications, massively parallel processing is increasingly an option for commercial companies that have pushed their existing architectures as far as they can go.

By Alice LaPlante



A flexible future 46

A Virtual Visionary

46

Bill Davidow says the corporation of the future will be highly responsive and tightly linked with its core suppliers and customers. IT will provide the infrastructure, but first companies must undergo cultural change.

By Richard Pastore

Rating the New World Order

50

Now that users have gotten what they said they wanted—decentralized IS—are they satisfied with the results?

By Meghan O'Leary and Lew McCreary



Controlling their destinies 50

M O R E ► ► ►

Now's

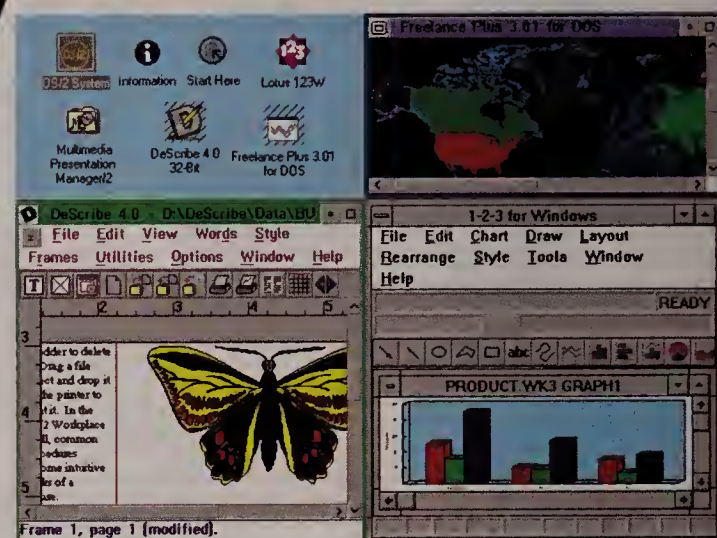
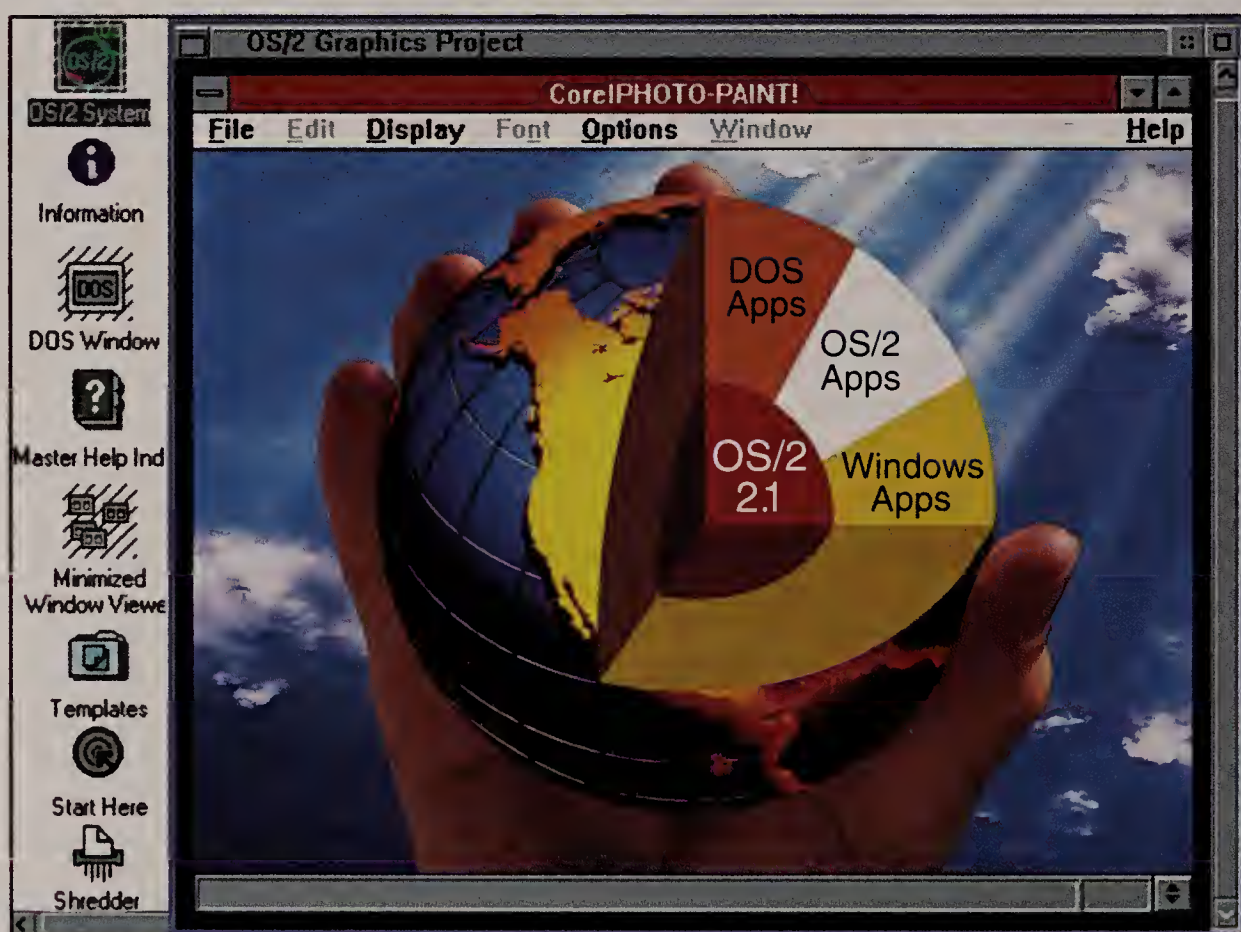
your

You wanted the power to choose from a world of different applications. DOS applications. Windows™ applications. OS/2® applications. OS/2 2.0 gave you the power. And the response was impressive, to say the least. Over two million copies shipped in less than one year. More than 1,200 OS/2 applications already available*. But now you want more. More features. More functions. More applications to choose from. That's why we're introducing OS/2 2.1.

The new OS/2 2.1 lets you run the latest Windows 3.1 applications, in addition to the DOS, Windows and OS/2 applications you can already run. We've also added TrueType fonts, select Windows applets, File Manager and support for Windows 3.1 printer and display drivers, including 32-bit seamless SVGA support. And now you can start DOS and OS/2 applications from a WIN-OS/2 session, too.

Portable users will be glad to know that OS/2 2.1 provides industry-standard Advanced Power

▼ *With OS/2 2.1 at the heart of your PC, you can run a world of DOS, Windows and OS/2 applications.*



▲ *There's no need to buy DOS and Windows to run DOS and Windows applications.*

Management (APM) support, to help extend battery life. We've made the cursor larger so it's easier to find your place on the screen. And

OS/2 2.1 continues to exploit the very latest in technology. You'll find improved support for multi-media applications and pen-based capabilities, along with built-in CD-ROM and AS/400® terminal emulation support.

Of course, OS/2 2.1 still gives you true pre-emptive multitasking, superior OS/2 Crash Protection™ and the easy-to-use object-oriented Workplace Shell™ interface. All the features that made Version 2.0 an award-winner. But now, you also get a whole new world of possibilities.



Introducing
Version 2.1



chance to run the world.

OS/2 2.1 is now also available on CD-ROM. It comes with exciting multimedia samplers, full-motion video demos and more.

**Demand OS/2 2.1
preloaded on your
next PC.**

With our free demo diskette, you can find out even more about all the

OS/2 2.1 Advantages

Improves productivity

- Now runs OS/2, DOS and new Windows 3.1 applications.
- New TrueType fonts, Windows applets, File Manager.
- Advanced Power Management (APM) support extends battery life for portables.
- OS/2 Crash Protection and pre-emptive multitasking.

Easy to use

- Now also available on CD-ROM.
- Object-oriented Workplace Shell interface.

Advanced 32-bit architecture

- Seamless SVGA support.
- Fully exploits latest multimedia applications.
- Supports CD-ROM, PCMCIA and pen technologies.

powerful features OS/2 2.1 has to offer. For your copy, to find out more about OS/2 2.1, or to order, call 1 800 3-IBM-OS2.

Call for your free
demo diskette.

In Canada, call 1 800 465-7999.

Operate at a higher level.™

IBM®

*To order CD-ROM with list of OS/2 applications, call Walnut Creek at 1 800 786-9907. IBM, AS/400 and OS/2 are registered trademarks and OS/2 Crash Protection, Workplace Shell and "Operate at a higher level" are trademarks of International Business Machines Corporation. Windows is a trademark of Microsoft Corporation. TrueType is a trademark of Apple Computer, Inc. ©1993 IBM Corp.

COLUMNS

INSIGHTS: INFORMATION PRESERVATION

A data warehouse provides an integrated source of timely, historically accurate data for informed decision-making.

By James W. Ashbrook

24

STATE OF THE ART: NOT ALL TALK

Computer-telephone integration is spreading to more organizations, and voices that once cried in the wilderness are now accompanied by all kinds of customer-specific information.

By Lucie Juneau

56



Deciding factors 24



Phone boosts 56

FRONTLINE: THE FOURTH ERA

Each phase of IT development—from mainframes to minis to desktops—has had its clear market leaders. Who will lead the next wave?

By Portia Isaacson

60

WORKING SMART: INSURANCE'S LOAN RANGER

Moving to a more-responsive client/server architecture has been a sound policy for AI Credit Corp.

By Meghan O'Leary and Carol Zarrow

72

DEPARTMENTS

Editor's Letter 10

Publisher's Letter 12

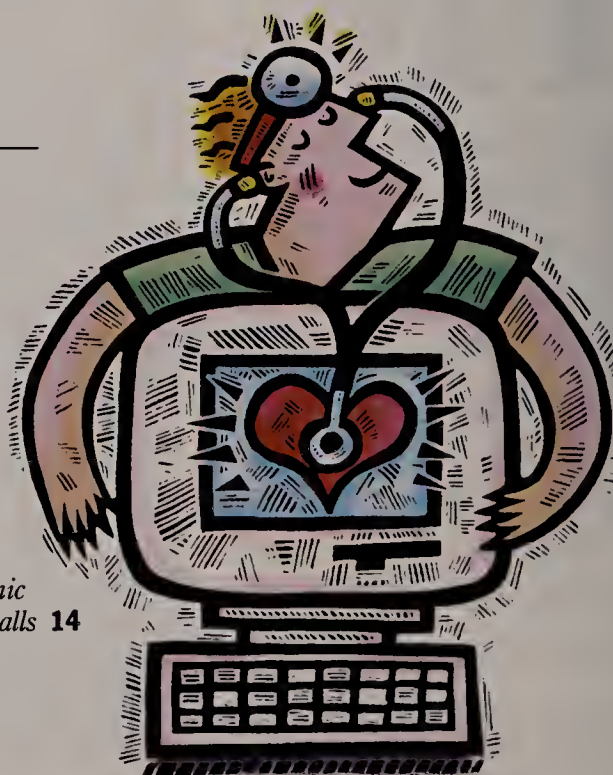
Trendlines 14

- ▶ Off the Shelf
- ▶ Rebuilding L.A.
- ▶ Health-care panel
- ▶ Quality-initiative survey
- ▶ New ventures
- ▶ A Big Blue wail

- ▶ Automated cashiers
- ▶ CIO contest
- ▶ Electronic physician
- ▶ Career moves
- ▶ Video grad school
- ▶ Data-center study

FYI 68

Index 70



Electronic house calls 14



*Russell West
Senior Vice President
Strategic Planning
Comdisco, Inc.*

“There is a way to measure the quality of your technology decisions.”

“Don’t reduce your technology costs in such a way that they can’t *continue* to be reduced. The last thing you want is to save budget dollars today at the expense of mortgaging your future.

“With the right strategy, it’s possible to continually reduce your costs. Is your current strategy letting you do that? To find out, use the market as a yardstick. Compare what’s been happening to your expenses over the last few years with market trends. Then look at what’s likely to happen in the future. That’ll tell you the answer real fast.

“Every good technology strategy is built on a sound financial footing. That takes market knowledge and creativity. And that’s where Comdisco excels.

“If you’re not sure whether your strategy measures up to the realities of today, talk to us. We’ll show you some smart ways to solve your problems, and we’ll save you money. That’s Comdisco’s job, and nobody does it better.”

*Comdisco is one of the world’s largest and most experienced independent high-tech asset consultants.
Our strength is people like Russ West...people who know your problems and how to solve them.
Let us show you how to measure — and improve — the quality of your technology decisions.*



HIGH-TECH ASSET MANAGEMENT SOLUTIONS

FOR A FREE
INFORMATION PACKET
CALL 708-698-3000
EXT. 4530.



Only one can be the best.

CIO is proud to have won the "Best Computer Magazine Award" in the 1993 Computer Press Awards competition—especially when you take a look at the overabundance of magazines vying for attention.

We know our 70,000 executives receive anywhere from five to fifteen magazines a week. But when they want to learn how to manage technology, there is only one magazine they turn to.

CIO is the *only* magazine that provides detailed case studies on successful implementations of information management solutions and in-depth articles that cover information technology trends that address today's important business issues.

And none of this could happen without thirteen very important people—the talented team of editors, writers, and graphic designers who create our award-winning magazine.

They are the real stand-outs.

Allan Alter
Marcia Blumenthal
Leigh Buchanan
Brooke Burton
Cheryl Davis
Moira Gillis
Tom Kiely
Abbie Lundberg
Mary Marshall
Lew McCreary
Kim Morneau
Rick Pastore
Megan Santosus

CIO . . . The winning source for technology management information.

CIO Publishing • 492 Old Connecticut Path • P.O. Box 9208 • Framingham, MA 01701 • 508-872-8200



Here's a complete list of companies that can offer you all three fast packet services.

1. Bell Atlantic
- 2.
- 3.
- 4.
- 5.

Your search for efficient, cost-effective, reliable data communications solutions is finally over. Bell Atlantic* is the first and only vendor in the region to offer three state-of-the-art fast packet services: SMDS, Frame Relay, and FDDI Network Services. Because we offer the widest selection of fast packet services, we can customize the perfect solution for your business. For more information, please call.

1-800-422-0455

* These services are provided by the Bell Atlantic telephone companies, including Bell of Pennsylvania, Diamond State Telephone, the C&P Telephone companies and New Jersey Bell. Services are subject to availability in each jurisdiction.

 **Bell Atlantic**
We're More Than Just Talk.®



With all the attention paid to groupware these days, you might think it has become the technology wave of the '90s, but workgroup computing is going to encounter some of the same barriers the telephone or steam engine did before its acceptance changes the face of the workplace.

In his article "Learning To Share," beginning on Page 38, Senior Writer Tom Kiely explores the ins and outs of groupware technology at two leading consulting firms, Price Waterhouse and McKinsey & Co. Both of these companies are formidable users of Notes, the current de facto standard for workgroup computing from

Lotus Development Corp.

To date, it looks as though the primary value of groupware is rapid electronic communication and access to shared corporate information. But the move to electronic teamship has been elusive. A good part of this has to do with corporate culture—people have yet to conclude that working in teams and sharing proprietary, specialized information is in their best interest. For the knowledge-based worker, the ability to massage information and turn it to productive use is the grist of career advancement. Heavy-duty reengineering remains to be done before the benefit of collective corporate mind-think begins to take hold. Yet companies that are early adopters of groupware are enthusiastic proponents of the concept, even if the new-age vision of the technology and its actual use are not exactly in synch.

Technologies such as groupware will be important to fashioning the new enterprise envisioned by Bill Davidow, author of *The Virtual Corporation*. In an interview beginning on Page 46, Davidow tells Senior Writer Richard Pastore that it is up to the information executive to communicate to top management, corporate divisions, customers and suppliers how electronic tools can facilitate new corporate processes.

Next month marks our magazine's sixth annual CIO-100 issue. What makes the CIO-100 unique is that it covers new terrain each year, looking at a key business issue and how information management provides solutions to business problems. This year we honor public- and private-sector organizations that have made customer service a primary focus.

Marcia Blumenthal



© By CIO Publishing Inc.

Publisher/Editorial Director JOSEPH L. LEVY

Editor-in-Chief MARCIA BLUMENTHAL

Managing Editor LEW MCCREARY

Art and Design Director MARY LESTER MARSHALL

Special Projects Editor ALLAN E. ALTER

Associate Editor ABBIE LUNDBERG

Associate Editor LEIGH BUCHANAN

Senior Writer THOMAS KIELY

Senior Writer MEGHAN O'LEARY

Senior Writer RICHARD PASTORE

Writer/Researcher MEGAN SANTOSUS

Copy Editor CHERYL R. DAVIS

Assistant Art Director MOIRA GILLIS

Design Associate KIM MORNEAU

Design Associate KELLI E. WALTON

Editorial Assistant BROOKE R. BURTON

Director of Marketing CATHY O'LEARY HAYES

Production Director LORI BETH SADEWITZ

Director of Finance & Admin. WALTER MANNINEN

Assistant to the Publisher DIANE MARTIN

Circulation Director CAROL A. SPACH

Fulfillment Manager SUSAN WOODWORTH

Exec. Subscription Manager NANCY A. O'CONNELL

Senior Promotions Specialist MARCY L. DILL

Production Associate MICHAEL C. PETERSON

Sales & Marketing Specialist BRIDGET CAMMARATA

Sales & Marketing Assistant DOT CASPERSEN

Circulation Assistant DENISE PERREAU

Administrative Assistant LYNN J. PALMQUIST

VP/GM, Exec. Programs LYNDA ROSENTHAL

Director, Exec. Programs DEBORAH HALON

Registrar ELIZABETH L. LADENDECKER

Administrator, Exec. Programs CHRISTINE MCCARRON

Contributing Writers James W. Ashbrook, Portia Isaacson, Lucie Juneau, Alice LaPlante

Contributing Researcher Carol Zarrow

Editorial Offices CIO Publishing Inc., 492 Old Connecticut Path, P.O. Box 9208, Framingham, Mass. 01701-9208 (508) 872-8200, FAX (508) 879-7784. Printed in the U.S.A.

Subscriber Services (800) 788-4605



Board Chairman PATRICK J. MCGOVERN

President WALTER BOYD

Executive Vice President WILLIAM P. MURPHY



When It Comes To Client/Server Computing, Think Big. Start Small.



EDA/SQL From Information Builders. The Data Access Standard For Client/Server Computing That Grows With You.

MAKING THE MOST OF YOUR ASSETS

Data is one of the most strategic assets any business can have. Because businesses that utilize data well, will succeed. Businesses that don't, won't.

The trick is knowing how to use your data resources in the most cost effective way.

That's where Enterprise Data Access/SQL (EDA/SQL) as a client/server solution can make the difference.

OPENNESS, POWER AND FLEXIBILITY

Implementing client/server applications can be tough, particularly when you need to access remote data on diverse platforms.

With EDA/SQL, you have the freedom to access data in over 50 different databases and files, running

on 35 computing platforms using any major network protocol. And there are dozens of applications and tools available from more than 50 leading software vendor partners that support EDA/SQL.

No other SQL solution on the market gives you this much flexibility.

BIG OR SMALL, IT'S ALL THE SAME

EDA/SQL has the power and the ability to drive the largest enterprise-wide implementation, or to simply connect a single client/server application to a specific data source.

And because there's an EDA/SQL solution for every popular platform, and network protocol, you can use it in the environment of your choice.

Only EDA/SQL has the scalability and configuration flexibility to meet your client/server requirements both today and tomorrow. You can start with the EDA/SQL solution you need today. Then, efficiently and economically grow any configuration to meet your changing business requirements. Big or small.

For more information on EDA/SQL, our consulting services and education programs, or to attend a FREE Seminar...

Call 800-969-INFO

In Canada call 1-416-364-2760

IBI  **EDA/SQL**
Information Builders, Inc.

EDA/SQL is a trademark of Information Builders, Inc., 1250 Broadway, New York, NY 10001



Second time at bat and we hit a home run. This April, *CIO* took home the coveted honor of "Best Computer Magazine," bestowed upon us by the Computer Press Association at its annual awards ceremony. It was the second time we entered the competition and, as a relative newcomer to the industry, we had our fingers crossed for a runner-up spot. Instead, we hit the big one, and it felt great.

More important than the accolades is the fact that this award further legitimizes the vision of this magazine. *CIO* was created to be more than a "computer" magazine. Its goal was to provide you with a better understanding of the role IT plays in achieving both corporate objectives and your career goals. Whether you're contemplating a multimillion-dollar system or have already invested in one, it is *CIO*'s mission to provide pertinent, timely and useful information to help you make the right decisions.

In this month's arsenal of information, for example, you can read how culturally divergent Price Waterhouse and McKinsey & Co. took different approaches to workgroup computing—and how the technology paid off for both companies. An interview with futurist and venture capitalist Bill Davidow prepares you for the age of the virtual corporation. And a feature on how several commercial companies are using massively parallel processing to cope with their prodigious information needs proves that the technology is not just for scientific applications anymore.

Walter L. Lutz

P.S. Registration is well underway for the upcoming *CIO* Perspectives Conference, "The Politics of IT: Reordering the Enterprise." The dates: Oct. 17-20. The place: Westin Mission Hills, Rancho Mirage, Calif. Please call our toll-free registration hot line at 800 366-0246.

Coming In CIO

Customer-Service CIO-100

Superb customer service has become a mandate in the '90s, and this year's CIO-100 recognizes those organizations that excel at keeping their clients happy. An independent panel of experts has chosen the top companies and government agencies in this area. We'll examine the business strategies, information-gathering activities, applications and technical infrastructures that enable this year's winners to understand, meet, and in many cases, exceed their customers' expectations.

Rooting Out Dissatisfaction

Information technology is critical to Xerox's ability to ruthlessly track down and wipe out every element of customer dissatisfaction through excellent service. Said Xerox's chairman and CEO: "Our information systems allow us to relate whatever it is we hear about dissatisfaction to its causes in any aspect of the business."

Corporate Creativity

Du Pont employs a creativity-driven management approach to generate and carry out innovative projects. *CIO* takes an inside look at this highly effective process.

PHOTO BY GEORGE SIMIAN

ADVERTISING SECTION

CTO

THE MAGAZINE FOR INFORMATION EXECUTIVES

HOW TO DODGE THE DOWNTIME BULLET





HOW TO DODGE THE DOWNTIME BULLET:

STAYING COMPETITIVE WITH HIGH-AVAILABILITY SOLUTIONS

Until recently, ensuring dependable availability has been prohibitively expensive for most applications. Now, however, some commercially-oriented open systems platforms offer cost-effective high-availability alternatives that promise to reshape how IS managers implement their key business applications.

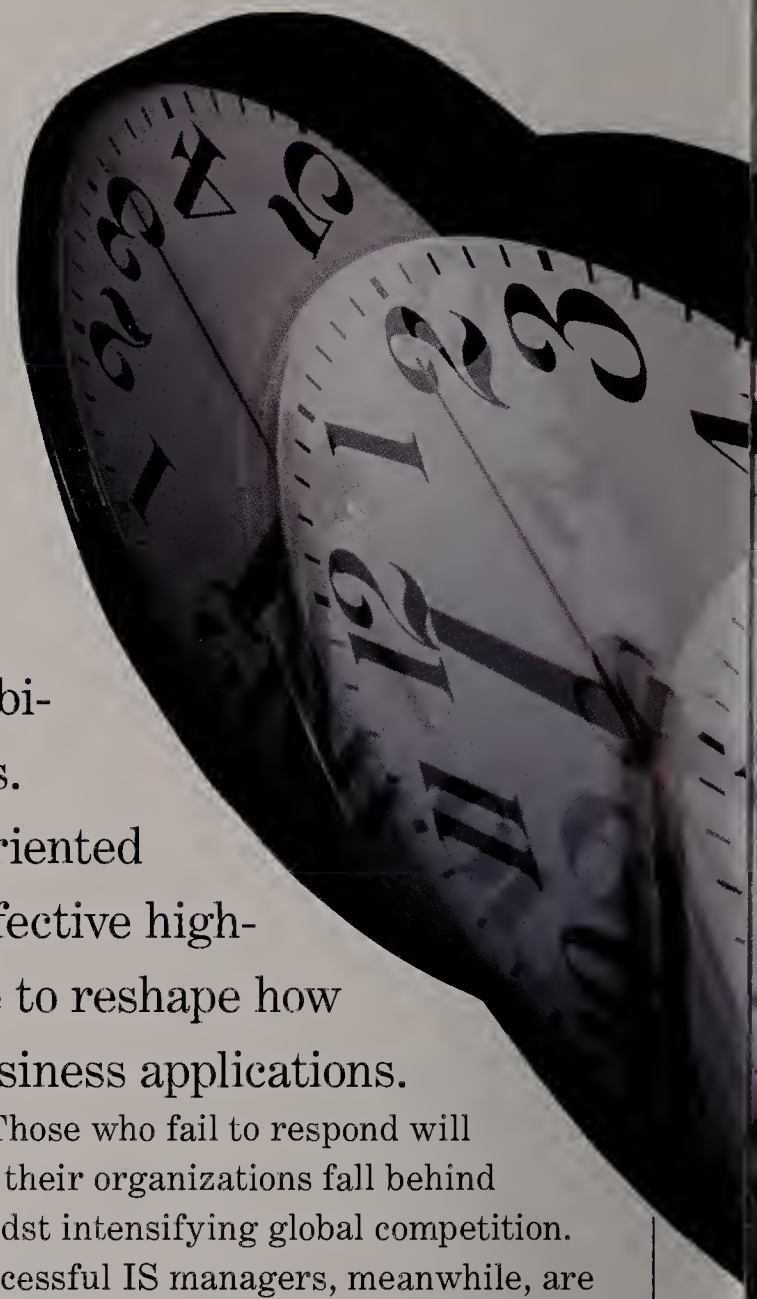
There seems to be just one constant in the tumultuous 1990s: *change*. It isn't easy to keep a competitive edge in a world buffeted by new kinds of business strategies and new kinds of technologies. And nowhere is the pressure greater than on information systems (IS) executives, who must achieve more with fewer resources, effectively responding to demands for:

- *Better, faster customer service,*
- *Constant, easy access to critical business information,*
- *Improvements in quality,*
- *A worldwide communications capability.*

Those who fail to respond will see their organizations fall behind amidst intensifying global competition. Successful IS managers, meanwhile, are finding ways to exploit new technological opportunities, especially those opportunities—such as open systems—making it easier to leverage all available corporate resources.

To flourish in the 1990s, organizations need information systems that are:

- *Expandable in response to evolving business needs,*
- *Easily manageable,*
- *Flexible and adaptable,*



• *Reliable and always available.*

All of these requirements—availability, reliability, adaptability, flexibility, manageability and expandability—are utterly essential for competitive success in the 1990s. But of them all, *availability* is growing in importance most quickly as organizations automate more and more of their core business functions. Why? Because if applications are not available when they're needed, all other IS capabilities are lost, too.

This special report, sponsored by Data General Corp., shows how all of these essential information systems requirements can be met by **high-availability open systems** that are cost-effectively configured to address the availability and reliability demands of an organization's key application environments—without compromising expandability, manageability, flexibility or adaptability.

The Dangers Of Downtime

Downtime comes in two general forms: planned and unplanned. IS managers often have to plan downtime to back up data, upgrade software and maintain systems. Unplanned downtime is typically the result of system or component failure, software glitches or human error.

It's easy to be deceived by the numbers into thinking that downtime isn't really a serious problem. For example, a "typical" industry-standard open system may, by the numbers, be

reliably operational 99% of the time. But in the real world that's 5,000 minutes—more than 83 hours—of downtime a year. Certainly 83 hours of downtime is potentially devastating for, say, a brokerage house's trading system, a manufacturer's process control system or a retailer's point-of-sale system. And it can be pretty expensive for many other application environments, too.

Each business and application is differently affected by downtime. IS managers can assess the potential devastation by answering a few questions. Each YES answer points to serious damage from downtime—any downtime:

- *Is the data maintained by your application(s) crucial for conducting business?*
- *Does this data need to be continually accessible?*
- *Is the application required to be available at least eight hours per day for six or seven days per week?*
- *Does the application support essen-*

Cost Of Unplanned Computer Downtime

Responses of 450 information executives
at Fortune 1000 companies

Annual revenue lost: **\$3.4 billion**

Average downtime: **4 hours**

Number of hours lost to downtime: **37.3**

Average revenue lost per hour of downtime: **\$78,191**

Productivity lost to downtime: **\$400 million**

Total losses from downtime: \$4 billion

Source: "Survey Pegs Computer Downtime Costs at \$4 Billion,"
Melinda-Carol Ballou, Computerworld, August 10, 1992.

tial business management, operations or customer service functions—that is, can you run the business without the application(s)?

- *Would any significant application downtime or data loss directly affect revenue, customer service or your organization's ability to deliver product?*
- *Would application downtime or data loss blunt your organization's competitive edge?*
- *Is the cost of fully-redundant fault-tolerant systems too great to be warranted for the application?*

A Cost-Effective Solution To Downtime: High Availability

A highly available system does not go down as often as a typical system.

And if it does fail, its functionality can be restored more quickly than a typical system.

Because high-availability systems reduce the numbers of single points of failure, users have access to their data and applications virtually whenever they need them, and managing their data and applications is just a little bit easier.

High Availability Vs. Fault Tolerance

High-availability solutions are not the same as systems that provide single-system fault tolerance through redundant hardware components and specialized software, both of which are proprietary, thus making design development and testing costly. Because such fault-tolerant systems require application software

to be written for their proprietary environment, those implementing these systems need specially-trained programmers and administrators.

For a certain class of applications (*e.g.*, airline reservations, air traffic control, automated teller machines) the substantial expense of fault-tolerant systems—usually more than double the price tag of high-availability systems—can be cost-justified.

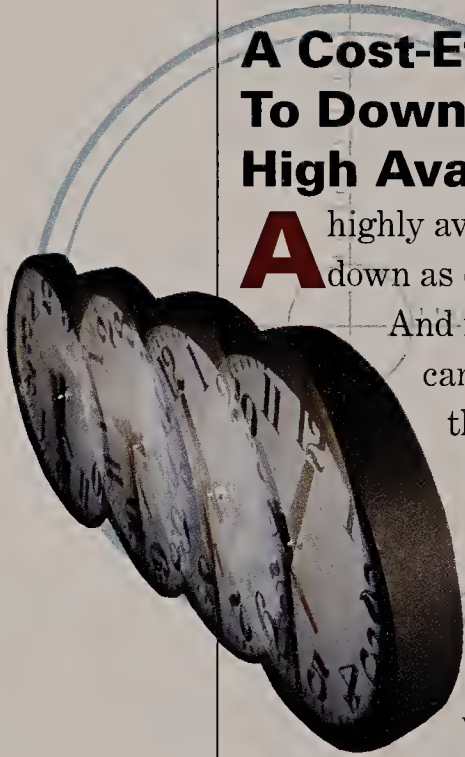
Because high-availability open systems platforms cost less, they can be used to improve or justify development of the many other business-critical applications for which fault tolerance is too costly.

High-availability systems provide much higher levels of application availability than typical systems through combinations of operating system components, mirrored and redundant disk arrays, redundant and online-replaceable I/O components, hot backup systems, and so on.

High-availability open systems can be built from standard, low-cost components. In order to be effective, they must be configured with specially-designed system software to provide increased availability. In highly available systems, Redundant Arrays of Inexpensive Disks (RAID) architectures can be implemented to create variable levels of data redundancy with a minimum increase in cost, so data is protected and uninterrupted data access is supported even when individual drives occasionally fail. Moreover, high-availability solutions can provide multi-host availability.

What High-Availability Open Solutions Must Deliver

To meet the business needs of today's



organizations, high-availability systems must combine four key ingredients:

- **Near-continuous application availability**, so that users can always access the data and applications they need.
- **Cost-effectiveness**, so organizations can remain productive and competitive by getting the best possible system performance and capability for the price.
- **Openness**, so users are assured that their systems are viable vehicles for long-term growth. Such openness involves both **performance scalability**—that is, being able to apply the power of multiple systems to a single application—as well as **availability scalability**, being able to apply the reliability of multiple systems to a single application. Openness also involves **interoperability**, the ability to extend high-availability systems into multivendor open system client environments.
- **Service**, so high-availability solutions and configurations can be designed for an organization's specific application environments. Implementation assistance can range from failover scenario planning and programming to training to full-scale onsite installation.

In addition, to achieve the high-availability levels they need in their commercial applications, many organizations need vendors to provide ongoing systems monitoring, including remote diagnostics, as well as full disaster recovery facilities.

Data General's High-Availability Solutions

With its AViiON family of Open Enterprise servers and workstations, Data General provides a range of high-

availability solutions to meet the various commercial computing requirements of open systems users.

Focus On Preventing Application Loss

Data General's AViiON system-based, high-availability solutions use the latest hardware and software technologies to reduce occurrence of failures, recover quickly from failures and lessen applications' visibility to failures. These solutions are low-cost and highly configurable so that they meet IS' specific price and high-availability requirements. For Data General, high availability is not an add-on—it's built-in:

- **AViiON** systems are "redundant-ready." The base

AViiON system—which includes hardware, operating system and diagnostic software AV/Alert—comes with built-in, redundant capabilities, such as power and cooling components, CPUs and memory. Other redundant options—for instance, I/O chassis and I/O controllers—may also be purchased. Users can mix and match redundant components to get the maximum availability they need for particular sys-

ORACLE PARALLEL SERVER: BRINGING HIGH AVAILABILITY TO DATABASE APPLICATIONS

► "High availability is not a new concept to IS professionals," says Nimish Mehta, vice president, midrange systems at Oracle Corp. "What is new is that high-availability features, like clustered systems and automated failover, can be found at entry-level prices on open system platforms. Oracle and Data General are working together to ensure that the high-availability and performance scalability features of ORACLE Parallel Server can be obtained at pricing that is attractive for the entry-level user, with the capacity and robustness for the most demanding, mission-critical applications."

tems and applications.

- **The DG/UX 5.4 operating system's** high-availability features including on-line disk management, fast file recovery and system failover, are standard components rather than priced separately.
- **AV/Alert**, Data General's monitoring and diagnostic system, automatically detects and reports existing or impending hardware or software problems before

they result in extended downtime. With machine-initiated callout and remote trouble-shooting capabilities, AV/Alert can reduce overall service costs and the total cost of system ownership.

- **CLARiiON disk arrays** simultaneously support several RAID levels and are flexibly designed to accommodate a number of commercial transaction processing applications.

AViiON DELIVERS FOR CHOICE COURIER SYSTEMS

► By 1991, Choice Courier Systems, the largest on-ground courier service in the U.S., had outgrown its computer system.

A high-volume and high-speed business with offices up and down the East Coast, Choice Courier has just 60 to 90 minutes to turn an initial phone request into a completed order. To accomplish this feat, each record requires about 12 to 20 computer and phone transactions. And there are more transactions after an order is processed, to maintain the record and provide follow-up information.

Understanding that it needed a dependable, open system to not only meet growing customer demand, but to expand its operations, Choice Courier installed a Data General AViiON system on July 21, 1991.

"We've got to have total reliance on our computer system," says Mike Beck, Choice Courier's senior vice president and chief finance officer. "In our business, the telephone is the first piece of equipment, and the computer is

the second. We looked at about five vendors—all good, all very competitive. We set up certain benchmarks for the vendors, the most important of which was speed of transaction. Data General was a step ahead of the competition in most areas, especially speed. And the system never locked up on orders. We are still satisfied with our original configuration, which is impressive, considering how rapidly technology changes."

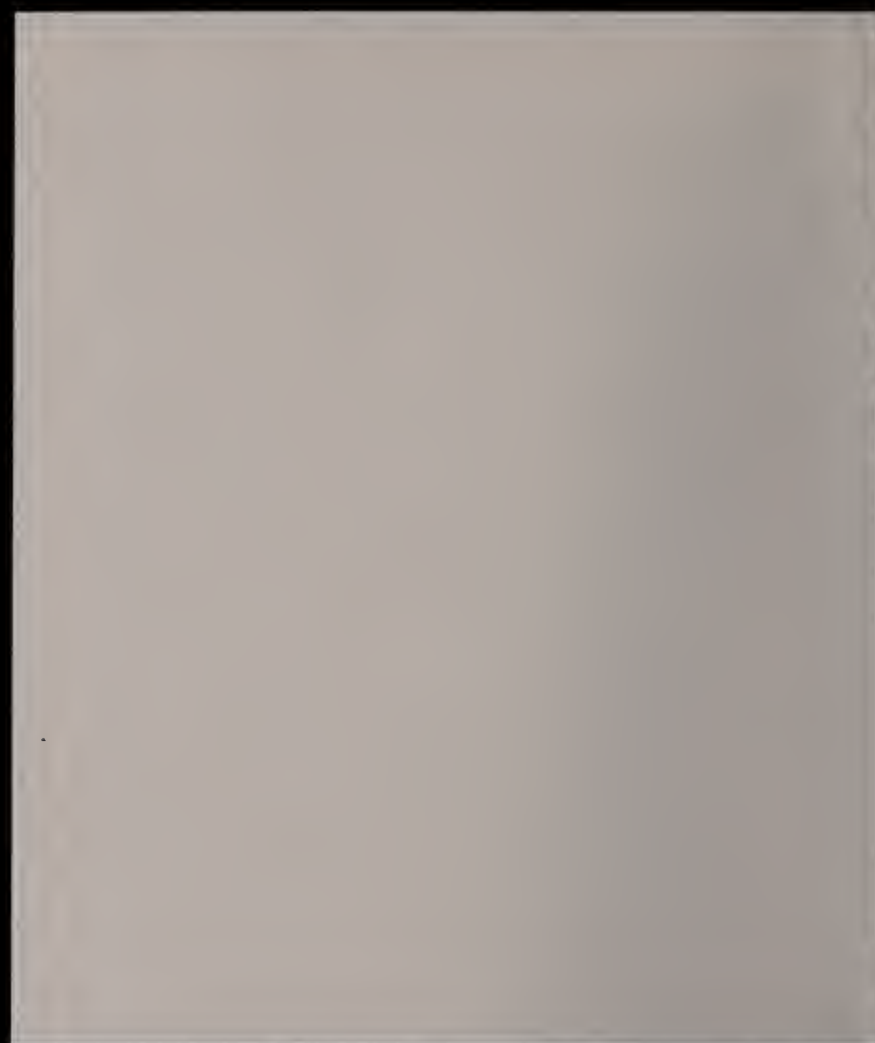
Choice Courier offices use an AViiON system and CLARiiON disk array subsystems and report that the Data General system is not only reliable, but has allowed the company to increase the business volume it handles. Since installation of the AViiON system, the number of orders processed per day by each of Choice Courier's customer service representatives has increased by 20%.

"That's a lot," confirms Beck. "Before, even with the lower number of orders per day, people would sit and tap their fingers, and

be frightened that our old computer system had gone down because it was taking so long to process an order. Now we can expand our business, because of the AViiON system.

"We're very confident with the system," Beck concludes, "and the service has been super. The most service we *have* had has been protective maintenance. In fact, we sometimes have 'fire drills' to have everyone practice what to do if the system goes down. In our business, if the system is down for any length of time at all, it can mean a loss of \$10,000 to \$30,000 on a particular day due to the expense we would incur to operate manually and then recover after going back online. Of course, if we lost customers due to computer outage, the loss of revenue would be unmeasurable. With AViiON, that's never happened.

"For us, reliability matters more than anything else. And the most important thing about Data General is that what they told us in the beginning really became true."



Yes, I want to dodge downtime with Data General's High Availability Solutions!

Please send me more information on:

- ☐ Data General's High Availability Solutions
- ☐ AViiON Family of Systems
- ☐ CLARiiON Disk and Tape Array Subsystems
- ☐ ORACLE Parallel Server

- ☐ Level 1: Standard System
- ☐ Level 2: Increased Data Integrity
- ☐ Level 3: Fault Resilience
- ☐ Level 4: Increased Fault Resilience

☐ I would like to see a Data General High Availability Solution in action. Please send me your demonstration video.

☐ Please have a sales representative call me.

Current platform:

- ☐ DG ☐ DEC ☐ NCR ☐ HP ☐ SUN ☐ Sequent ☐ Pyramid ☐ RS/6000
- ☐ AS/400 ☐ IBM Mainframe ☐ Other _____

Purchase timeframe for UNIX systems:

- ☐ Less than 3 mos ☐ 6-9 mos ☐ More than 1 yr.

Name: _____

Title: _____ Company: _____

Street: _____ City: _____

State: _____ Zip Code: _____ Phone Number: _____

Return this card, or call 1-800-DATA GEN. Outside the U.S. call 508-898-4410.
33612

 Data General



NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST-CLASS MAIL PER MIT NO. 26 HOLLISTON, MA

POSTAGE WILL BE PAID BY ADDRESSEE



P.O. BOX 6100

HOLLISTON, MA 01746-9863



• **CLARiiON tape arrays** provide fast, fault-tolerant, unattended backup for large databases.

AViiON: Levels Of High Availability

Data General knows that, to be effective, its Open Enterprise, high-availability servers must be matched to customers' particular application environments and availability needs. That's why Data General has not only raised the floor of high-availability functionality by building it into standard entry-level AViiON systems, but has also implemented increasingly powerful high-availability capabilities across the entire AViiON product line.

Thus AViiON high-availability systems are modular and scalable—from stand-alone AViiON with CLARiiON disk arrays to multi-host fault-resilient systems.

Thanks to the state-of-the-art DG/UX

operating system as well as redundant hardware capabilities, the base AViiON configuration provides fundamental high-availability proficiency in a full range of commercial environments—and can be cost-efficiently upscaled in increments, according to an

organization's changing needs.

Data General has defined four AViiON open high-availability levels:

• **Level 1: The Standard AViiON System.**

This includes AViiON hardware as well as the DG/UX operating system and AV/Alert. Error correcting code, eight-way symmetric multiprocessing and automatic CPU and memory reconfiguration and rebooting are configurable elements of Level 1. In addition, optional I/O channels afford application-transparent protection against peripheral controller failure.

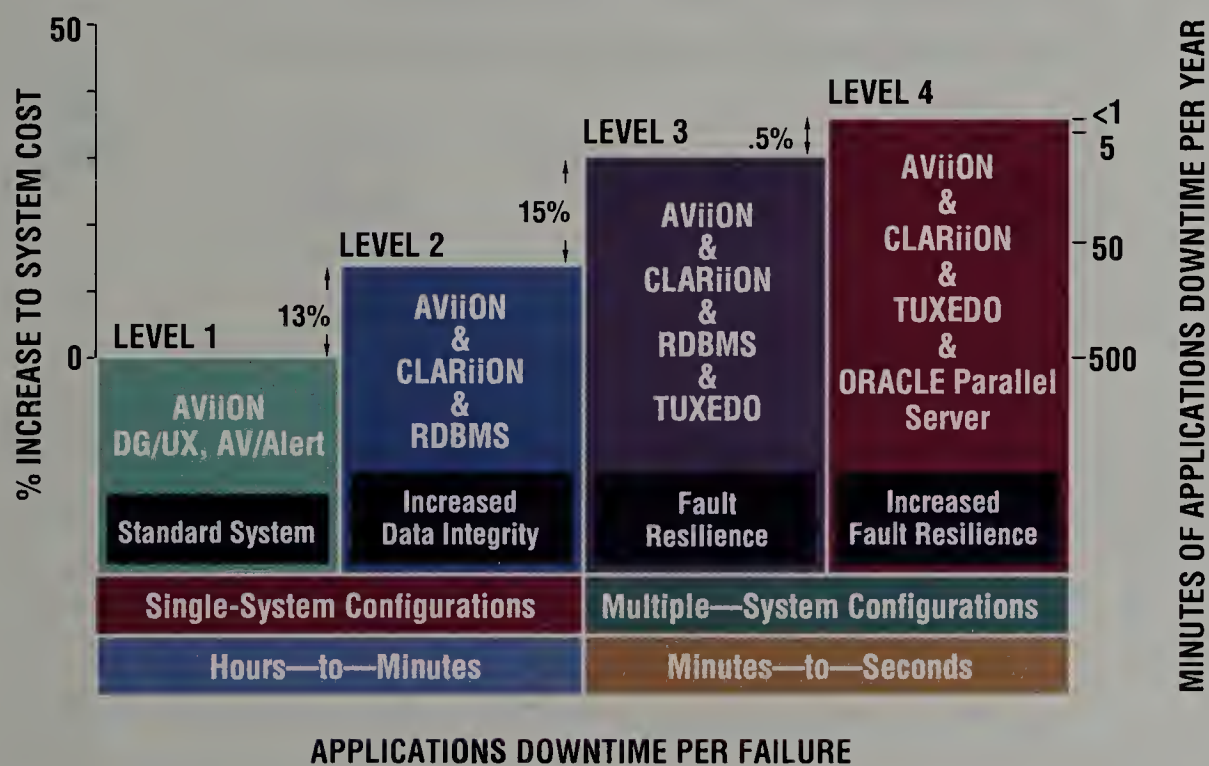
• **Level 2: Increased Data Integrity.**

In addition to the components and capabilities included in Level 1, CLARiiON disk and tape arrays and a relational DBMS (e.g., INFORMIX, INGRES, ORACLE, PROGRESS and SYBASE) are incorporated, increasing application-transparent

"We believe Data General offers the best single-system high-availability capabilities for the dollar."

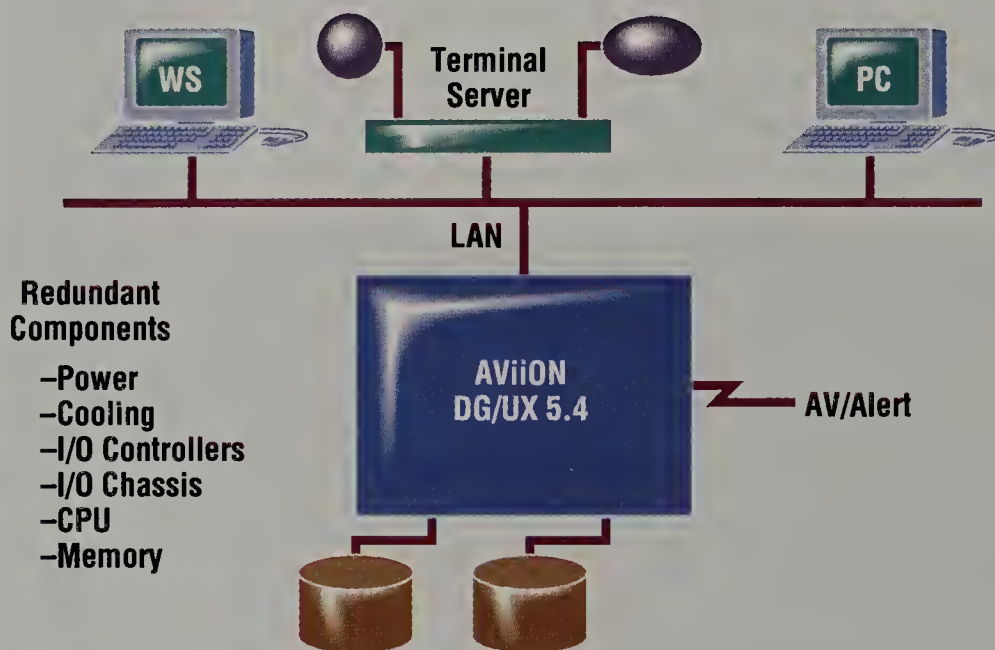
John Morrell, International Data Corp.:
"Assessing High Availability Requirements for UNIX Systems,"
October, 1992

Levels Of AViiON Applications Availability



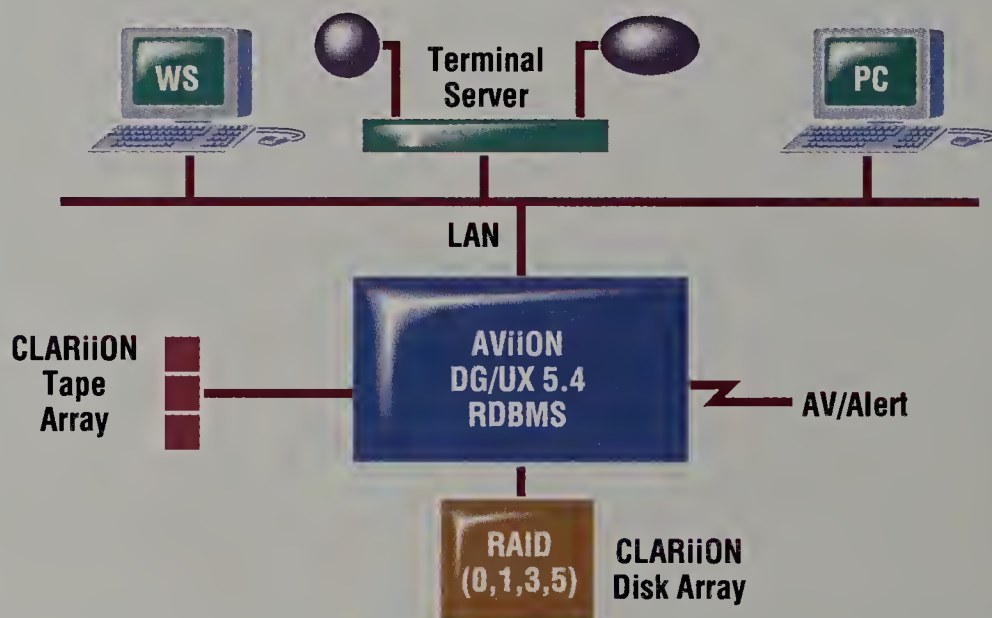
Source: Data General Corp.

AViiON High Availability Level 1 Standard System Example Configuration



Source: Data General Corp.

AViiON High Availability Level 2 Increased Data Integrity Example Configuration



Source: Data General Corp.

protection against data loss, as well as applications-level data integrity.

• **Level 3: Fault Resilience.** UNIX Systems Laboratories' TUXEDO transaction processing monitor and a failover-oriented multiple system configuration are added at this level. The second system can be used to execute additional applications as well as act as the backup for the primary system. Cost of a second AViiON system is reduced, thanks to dual porting of peripherals, while applications recovery time is less than two minutes. DG/UX controls the system failover process, which can be machine- or operator-initiated. The TUXEDO transaction processing monitor, meanwhile, enables location-transparent client access to servers, redirects client requests to a secondary server in case of failure of the primary server, handles applications load balancing and can eliminate the need for planned system downtime because it enables online installation of software upgrades.

• **Level 4: Increased Fault Resilience.** A clustered multiple system configuration and the ORACLE Parallel Server add several benefits, including a single database image across sys-

tems, improved system availability, increased capacity and simpler database administration. At this level, application recovery time is brought very close to zero. The cost increase of Level 4 over Level 3 is less than 1%.

Open Enterprise High-Availability Solutions That Are Cost-Effective

Clearly, proprietary fault-tolerant and high-availability offerings are much more expensive than open-systems-based AViiON high-availability solutions which can include the DG/UX operating system, CLARiiON disk and tape arrays, AV/Alert diagnostic software, relational DBMSs, the TUXEDO transaction processing monitor and the ORACLE Parallel Server.

Many Data General customers have discovered that high-availability capabilities can be added to an existing AViiON configuration for as little as a 10%-to-15% cost increment.

Open Enterprise High-Availability Solutions

One reason that Data General's AViiON high-availability solutions are so cost-effective is their state-of-the-art design. Another reason is that they're *open*, constructed from standard, low-cost components so

that customers enjoy the best price/performance to be found anywhere.

AViiON runs a commercial implementation of UNIX Systems Laboratories' standard UNIX System V Release 4 operating system—DG/UX 5.4, which excels in data protection and system failover capabilities while complying with today's key open system standards.

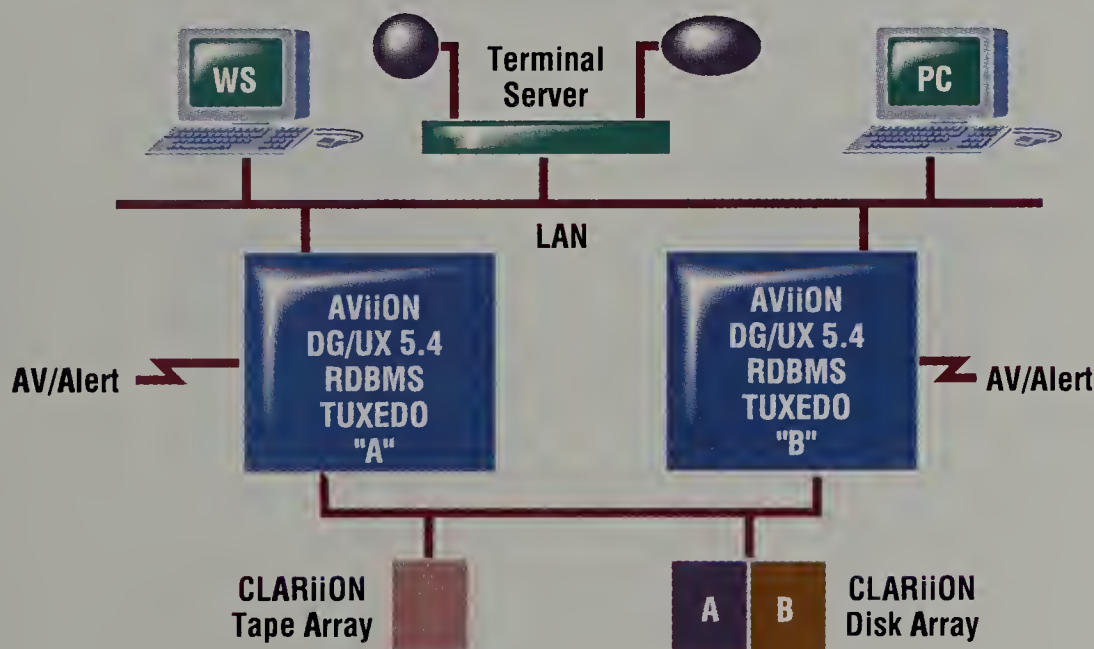
And, of course, AViiON servers run all of the major relational database management systems, including INFORMIX, INGRES, ORACLE, PROGRESS and SYBASE.

Data General remains committed to an R&D program that monitors standards developments and incorporates important standards as they emerge so that customers will continue to benefit from low-

"DG/UX in perspective: Well-designed and technically innovative, focused on commercial requirements, frequently ahead of the competition, full standard/open-systems benefits, a leading UNIX based operating system."

D.H. Brown
Associates, Inc.

AViiON High Availability Level 3 Fault Resilience Example Failover Configuration



Source: Data General Corp.

"Midrange and workstation-level UNIX systems from DG, HP, NCR, IBM and Sun offer varying degrees of high availability, with NCR and DG probably leading the way in current solutions that are shipping today."

Patricia Seybold Group, "Open Information Systems," February, 1993

cost, flexible high-availability systems that grow with their evolving needs.

Open Enterprise Services That Make High Availability Work

Data General offers a full range of high-availability services, from consultation before installation to onsite and remote programs to disaster recovery. Data General's systems engineers are experienced at designing detailed, specific high-avail-

ability solutions for a broad spectrum of industry and functional application environments. And DG's Network Integration Services Group can design and offer services to maximize network uptime. To ensure availability, networks can be designed with redundant components as well as alternate routing paths.

Data General: Ahead Of The High Availability Curve

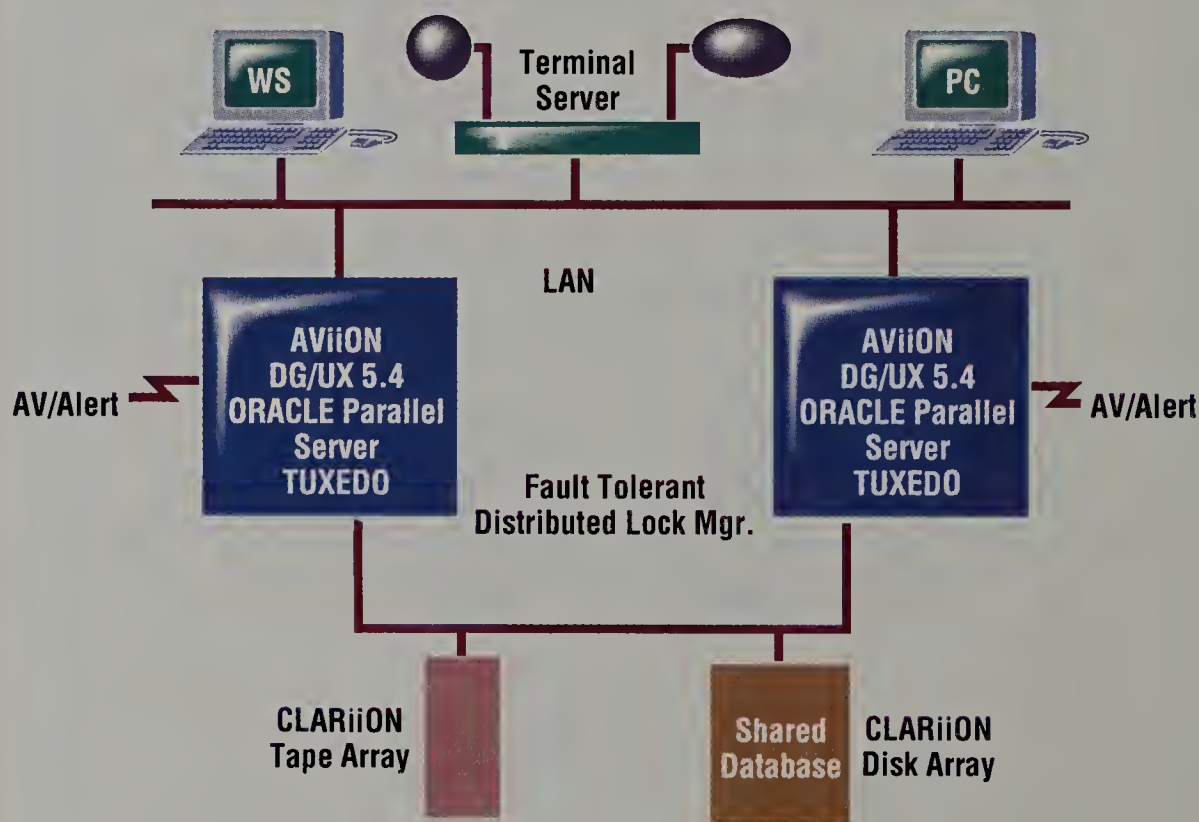
Open, cost-effective, high-availability solutions are fast becoming an important part of an information systems land-

scape in which downtime directly—and detrimentally—affects an organization's ability to function competitively.

As IS managers continue finding new and cost-effective ways to use open systems to fulfill business demands for quick access to critical information, improved quality and better customer service, Data General's Open Enterprise high-availability servers can ensure that key commercial applications rarely fail and never for long.

Data General is committed to assuring that its customers remain on high availability's leading edge, leveraging AViON's impres-

AViiON High Availability Level 4 Increased Fault Resilience Example ORACLE Parallel Server Configuration



Source: Data General Corp.

sive price/performance to always stay a competitive step ahead in the trying and turbulent 1990s.

For more information about the many

ways that Data General can help increase the availability of your important applications, call 800-DATA-GEN. Outside the United States, call 508-898-4410.

CLARiiON: PRECISELY ARRAYED FOR CONTINUOUS DATA ACCESS



In order to protect critical applications, systems must be engineered to safeguard data and ensure continuous operation

of disk drives. Data General offers cost-effective CLARiiON disk arrays and tape arrays for use with today's open systems-based high-performance, business-critical applications.

The CLARiiON Disk Array Subsystem

Supporting uninterrupted data access and securing data has become easier and less costly with Redundant Array of Inexpensive Disks (RAID) technology. RAID combines low-cost, industry-standard disks with data striping and redundancy schemes to provide high-performance data access and ensure data integrity, even when a disk in an array group fails.

Data General's CLARiiON Disk Array combines high performance, data integrity and large storage capacity in a user-maintainable, fault-tolerant subsystem about the size of a two-drawer file cabinet.

CLARiiON Disk Arrays can simultaneously support RAID levels 0, 1, 3 and 5, as well as independent drives allowing the disk subsystem to be configured to match the application's requirements.

The CLARiiON Disk Array can be configured with redundant disks, storage processor, cooling modules and power supplies. All of these redundant components are custom-replaceable under power. This means that despite the failure of any one of these components, data is available and protected with no application downtime. Supporting up to 20 gigabytes of data, the CLARiiON Disk Array is available in deskmounted and rackmounted versions.

The CLARiiON Tape Array Subsystem

With Data General's CLARiiON Tape Array, large amounts of data can be copied unattended in a minimum amount of time. Using the CLARiiON Tape Array, the tape drive is no longer a bottleneck in data copying.

Embodying contemporary data storage design, the CLARiiON Tape Array functions, from a software perspective, like a standard tape

(DAT) device—but with greatly improved performance, capacity and data integrity. Available in both rackmount and deskmount configurations, the SCSI-2-based CLARiiON Tape Array is supported on AViiON host systems.

Depending on the number of cartridges that are initially loaded into the array, the tape array configures itself according to one of these modes:

- As an individual drive in standard operation.
- In mirrored mode with two drives both recording the same data as if they were one.
- In striping mode, where data and parity are striped over all of the subsystem's tape drives.

The CLARiiON Tape Array acts like a single 4mm DAT product to all standard host utilities, but it actually houses between five and seven DAT Tape drives that function together. In the event of a failed media or drive, performance will be degraded—but the subsystem will continue to function, giving users full access to data, including the portion residing on the defective media or drive. Its high-performance, high-availability features make the CLARiiON Tape Array the best alternative to traditional tape storage implementations.



© 1993 Data General Corporation
 AViiON is a registered trademark and AV/Alert,
 CLARiiON and DG/UX are trademarks of Data Gen-
 eral Corporation. Other product names mentioned
 are the trademarks/trade names of their respective
 vendors.



AViiON HIGH AVAILABILITY BUILDS INTEREST AT UK MORTGAGE FIRM

► One of the United Kingdom's largest mortgage lenders, with ten million mortgage and savings customers, Abbey National has found that telemarketing is a good way to drum up business. But because an outside agency was used, maintaining adequate levels of customer service became difficult.

"The outside agency went through a script to get the information they required from the customer," explains Johann Edward, IT Manager for Abbey National Direct, the bank's telemarketing division. "If customers asked questions not directly covered by the script, the agency would forward them to us. This involved passing the calls through the switchboard, and perhaps through several people. Understandably, customers would get annoyed and go elsewhere."

To improve client service, the bank decided to bring its telemarketing operation inhouse and base it on a relational database management system. Given the speed at which mortgage rates fluctuate and the fact that many of the bank's services are sold through intensive, time-limited direct mail campaigns, even brief periods of downtime can be very costly. So

to meet Abbey National Direct's business objectives, the new computer system had to provide a high level of reliability and data security.

"We wanted a fault-tolerant system," notes Edward, "but after surveying the market, it became clear that we couldn't afford one. To stay within budget, we felt that we had to exchange fault tolerance for functionality."

To his pleasant surprise, Edward has discovered that Abbey National Direct obtained both.

"With Data General's systems, we've been able to take a step-by-step approach, gradually upgrading to what is now a virtually fault-tolerant system without losing any of our existing investment."

The main computer driving Abbey National's system is an AViiON 6280, an eight-processor UNIX server. Connected to it is CLARiiON, a high availability disk storage system based on RAID technology, and a second AViiON backs up the principal computer. This configuration provides the automatic failover capabilities that are critical to Abbey National's operations.

Since all levels of RAID can be combined in CLARiiON, Abbey

National Direct has no difficulty using RAID level 5 on its database disks, RAID level 3 on its software disks and hardware mirroring on its systems disks.

"RAID 5 improves performance and also provides data security," Edward explains. "The beauty of this configuration is that the RAID system dramatically increases system performance, while the software mirroring capability built into AViiON and DG/UX provides the high availability that we need."

The second AViiON is not only available as a backup but is also used for application development and user acceptance testing.

"I appreciate the fact that the money we spend on our second machine doesn't just buy us high availability," says Edward. "It also buys us twice the functionality."

And Edward feels extremely confident about the reliability of almost every system component.

"With the CLARiiON disk array, five network cards divided between two AViiONs and dual power supplies, I'd venture to call ours a fault-tolerant system. Best of all, we've managed to build it at perhaps half the cost of a traditional fault-tolerant system."

Reprinted with permission of Datamation

THE CIO PERSPECTIVES SERIESsm

THE POLITICS of IT: Reordering the Enterprise

A Chairman's Worldwide IT Vision

Jim Maxmin, Laura Ashley Holdings

Whose Turf Is It Anyway?

Larry Grow, Motorola

Politics and Adhocracy

Laraine Rodgers, City of Phoenix

Internal Consultative Selling: Getting High Ticket Technology Funding

Mack Hanan, Greymatter Group

Changing Tires at Warp Speed

Hank Leingang, Viacom International

IT Humor: Who Gets the Last Laugh?

Rich Tennant, Editorial Cartoonist

Politically Correct Out-of-the-Box Thinking

Ken Harris, Kentucky Fried Chicken

Superior Relationship Strategy Skills

Dr. Tony Alessandra, Alessandra & Associates

The CIO's Responsibility in Driving Institutional Change

David Kearns, Xerox Corporation (retired)

October 17–20, 1993

Westin Mission Hills, Rancho Mirage, California

For more information, or to enroll

CALL 800-366-0246



THE MAGAZINE FOR INFORMATION EXECUTIVES

Corporate Hosts

DOZ-ALLEN & HAMILTON

**COMPUTER[™]
ASSOCIATES**
Software superior by design



THE ADVANTAGE OF CHANGE[™]



IMIRS

Information Builders

INFORMIX[®]

Lotus[®]

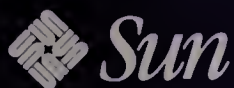
Nielsen



PICTURETEL

Racal-Datacom[™]

ROLM
A Siemens Company



**Technology Investment
Strategies Corporation**

**TEXAS
INSTRUMENTS**

TRENDLINES

THE FAX MACHINE ATE MY HOMEWORK

Encouraging staff members to pursue continuing education is smart management; enrolling them in an off-site program that eats up hours of work time in commuting is not. Employees at Oklahoma-based Halliburton Services, Conoco and Phillips Petroleum are going back to school without ever leaving the office thanks to interactive television classrooms made possible by a videoconferencing network from Southwestern Bell Telephone.

Each company—inconveniently located at least 50 miles from a state-college campus—purchased a package of Southwestern Bell video services and equipment that links instructors at the University of Oklahoma and Oklahoma State University with classrooms inside

the corporations. Students share graphics and computer programs with their instructors while taking graduate courses in such areas as computer science, business administration, and electrical and mechanical engineering.

The package includes video cameras, television monitors, speakerphones and fax machines. T1 telephone lines transmit the video and audio portions at speeds of less than 1.544 Mbps.

Students say their electronic classrooms are no different from traditional ones: They see and hear instructors, view educational materials, and ask and answer questions. And their employers reap the benefits of their education without the costs of transportation. ■



BACK TO SCHOOL: Conoco employees pursue master's degrees without leaving the office.



HEALTH-CARE PANEL

DOCTOR, DOCTOR, GIVE ME YOUR VIEWS

A panel of health-care and IT experts assembled last May by Hewlett-Packard Co. tackled the burning issues of the day: the evolving role of IT in patient care, barriers to progress and the effects of health-care reform. The panel included Paul M. Ellwood, of the Jackson Hole Group and InterStudy; Ode Richard Keil, of the Joint Commission of Accreditation of Healthcare Organizations; and M. Michael Shabot, of Cedars-Sinai Medical Center in Los Angeles. Here are some of their remarks:

On barriers to effective health-care IT:

Keil: "Provider behavior has to change. Doctors see technology as coming between them and their patients. Or, if they aren't technophobes, they may get so consumed with technology, it is a distraction from their patients."

Shabot: "It's almost overwhelming the number of pieces of information gathered. Yet in most hospitals this data is recorded by hand. No other major industry keeps its vital records in this way. We need an integrated electronic system."

On the potential effects of Clinton-administration health-care reforms:

Ellwood: "The Clinton reforms can force health care to embrace the electronic age. Up until now, it has escaped the information revolution of other industries."

"Under a reformed system, consumers will choose between health-care plans not on the basis of price but on outcomes like death rates. So we'll need a richer set of data for use in comparing outcomes. This will force the emergence of electronic medical records for comparison purposes."

On paying for it all:

Ellwood: "Clinical research has been funded by the fat of the fee-for-service system. Under reform, we may have to tax insurance plans to pay for this research."

Shabot: "Unnecessary or excessive use of diagnostic procedures has been calculated to cost \$30 billion a year. A clinical decision-support system can enhance patient care and cut costs by reducing these unnecessary procedures. At \$600 a day, a few days saved in an intensive-care unit can easily pay for a clinical system." ■

CAREER MOVES

Unisys Corp. has appointed RONALD K. BELL to the position of chief technology officer. In that role, he will oversee the company's research and development and engineering review processes to ensure appropriate investment in key technologies. He is also responsible for identifying and evaluating technology partnerships to support Unisys's strategic direction.

Most recently, Bell was the vice president and general manager of the company's Unix Systems Group. He will continue to head that group in an acting capacity. ■

You Want The *Ideal* Computing System?

You already know the benefits of combining the power and performance of UNIX® with the value of industry-standard Intel® platforms. Extremely high power at the low Intel price. That's a real advantage. And in business computing, nobody gets more out of UNIX and more out of Intel, than SCO®.

You need business-critical computing solutions that give you a real advantage — perfect for today,

prepared for tomorrow. And you can't afford to settle for anything less. The ideal solution is a reality today. It's SCO Open Systems Software.

Only SCO Open Systems Software — the new SCO Open Server™ Release 3.0 line of advanced server operating systems, and the new SCO® Open Desktop® Release 3.0 line of advanced desktop operating systems — allows you to build ideal business solutions for everything from advanced workstations to small-site servers to multiprocessor enterprise servers.

Nobody gives you the world's premier technology so easily and so cost-effectively. With 10 years of proven



Only SCO Delivers It. For Real.

experience, SCO continues to set the standard for business computing by delivering more applications, hardware choices, service and support than anyone else in the industry. And that's why today, we're the leading supplier of UNIX based business computing systems in more than 70 countries worldwide.

It's time to get a *real* advantage. Make the ideal system a reality for you. Call 1-800-726-9682. Today.

SCO [®]
OPEN SYSTEMS SOFTWARE
The Business Choice

WE'VE MADE THE IDEAL SYSTEM A REALITY.™

SCO Corporate Headquarters, Santa Cruz, California, USA 1 (408) 425-7222. SCO European Headquarters, Watford, UK +44 (0) 923 816 344. SCO, The Santa Cruz Operation, the SCO logo, SCO Open Server, Open Desktop and We've Made the Ideal System a Reality are trademarks or registered trademarks of The Santa Cruz Operation, Inc. in the USA and other countries. All UNIX references refer to UNIX Systems. All other brand or product names are or may be trademarks of, and are used to identify products or services of, their respective owners. © 1993 The Santa Cruz Operation, Inc. All Rights Reserved.

TRENDLINES

POST-IBM STRATEGIES

A BIG BLUE WAIL

An increasing number of IBM's customers are leaving the Big Blue fold, according to a survey of 50 Fortune 1000 CIOs conducted by Forrester Research Inc. Forty-two percent reported plans to cut back on purchases of IBM products and services. Another 26 percent are watching IBM closely and may go on a Big Blue diet later. Only 2 percent plan to increase spending on IBM goods.

Forrester notes that 66 percent of the respondents believe that IBM's influence with IS is declining, compared with 46 percent who believed this in 1991. Topping the list of CIOs' gripes with IBM were poor service and support, weak client/

server product offerings, high sticker prices and the proprietary nature of Big Blue's technologies.

Forrester recommends strategies for the three approaches IS executives might take to deal with IBM's possible breakup. Some CIOs, preferring the manageability of centralized computing, will opt to weather IBM's dark days. Forrester recommends they press for big price breaks on hardware and maintenance and increase purchases of used equipment or plug-compatible products; if downsizing, look to the AS/400. But there are risks: IBM's financial woes could eventually mean cutbacks in product development and weakened systems support.

On the other hand, CIOs who intend to jilt IBM stand to lose as IBM cuts service—so move fast to new platforms, Forrester recommends. The risks? Client/server technologies and vendors are raw compared with the stability of glass-house computing, and IS shops are still learning client/server skills.

A third, middle course: Balance IBM products with those from other vendors, cap development in proprietary environments (and perhaps hire an outsourcer to handle some centralized computing tasks), recompile portable applications for Unix systems and write new applications for client/server platforms. But this scenario has its own risks. If Microsoft's Windows NT proves successful, companies may have to rewrite Unix applications. IS executives may also face the cost of supporting parallel networks. ■

NEW VENTURES

Amdahl Corp. and EDS recently announced the creation of the Antares Alliance Group, a joint venture between the two firms to unify desktop, Unix and mainframe software. Amdahl is contributing its Huron application-development, -production and -maintenance system; while EDS is providing the In-CASE data-modeling and application-building system and its Cobol conversion and enterprise-modeling tools. The laboratories that designed these products are also being transferred to Antares, which will be headquartered in Dallas.

"Companies that are embracing client/server technology know there is substantial value in their legacy applications," said Joe Zemke, Amdahl's president and CEO. "Antares [products] allow an integration strategy so that client/server applications can easily include the mainframe as a server and preserve the integrity and security of existing database applications."

Oracle and U S West have joined forces to create a multimedia information server that will act as a link between consumers and the various forms of information and entertainment that will be made available when the nation's "information highway" becomes a reality. Based on database and messaging technology that can support massively parallel computers, the multimedia server will be able to process the thousands of transactions per second and manage the multiple data types—such as audio, video and text—that are required for interactive services. ■

VIRUS DETECTION

A recently released software program may bring new meaning to the term "operating system."

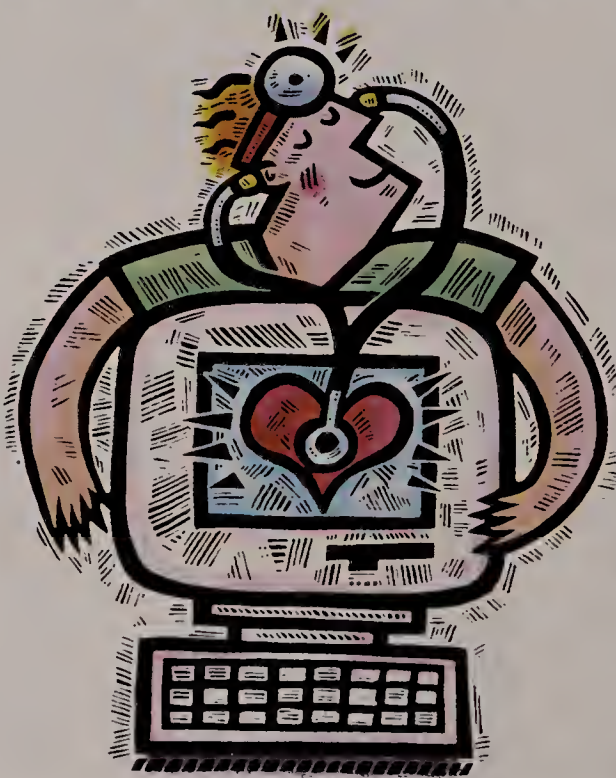
OK, so Personal Physician from West Bloomfield, Mich.-based FamilyCare Software won't let you perform emergency appendectomies via a GUI. But it may help users reduce doctor visits by providing desktop diagnosis and recommendations for home treatment of selected ailments.

The program is interactive and operates like a dialogue between physician and patient. Users begin by choosing among a group of 20 general symptoms or searching the program's online index of 1,700 key terms. The system then

asks a series of yes or no questions in order to zero in on a diagnosis. Finally, it prescribes a course of home treatment, changes in diet, over-the-counter medicines or—when warranted—a trip to a doctor's office or hospital.

The software covers everything from abdominal pain to urinary complaints. It also allows users to obtain information on prenatal care, administer alcoholism and depression self-tests, and analyze cholesterol levels.

The Personal Physician whose advice is thus made available is Dr. Isadore Rosenfeld, author of several books on personal health. The package has a suggested price of \$59.95 ■





The Navy Brought Us Aboard!

*And so did 40 of the
FORTUNE Top 50.*

The diversity among the world's largest companies belies a common concern that led 40 of them to *one* company . . . for one reason — unique connectivity solutions that leverage a most important asset: information.

Glasnost For The Glass House.

These companies recognized the value of information early on. They invested in IBM mainframes and SNA environments at headquarters and later built TCP/IP LANs to link other locations. As a result, they created huge repositories of information in their home offices, nimble networks in the field — and a frustrating inability to connect the two. Which is why they connected with us.

Access. Synthesis. Interoperability.

Our technology transforms these separate networks into seamless systems. So users the world over can easily access information in the mainframe, in a form synthesized to look like what they're used to. Which means they can actually *use* the information — massage it, manipulate it, integrate it — without compromising the integrity of your corporate database or your control over it!

Open Your World Without Closing Your Options.

Others debate standards, we deliver benefits. So if disparate systems have you looking at open systems, look to us . . . and enjoy the ultimate management option: to embrace new technology *without* risking past investments!

*To Learn More, Call Now.
(214) 484-5200.*

OpenConnect Systems
2711 LBJ Freeway
Dallas, TX 75234

OPENCONNECT

S Y S T E M S

Transforming Separate Networks Into Seamless Systems.

IDC Insight

INTERNATIONAL DATA CORPORATION

New Cost-to-Use Analysis Key to E

Sponsored by IBM Appli

IDC has developed a better method of evaluating costs of computing. Price/performance numbers based on hardware benchmarks are often extremely poor predictors of the actual computing costs users will face. This is especially true in situations where customers are distributing very-complex workloads across an enterprise.

Hardware price-performance benchmarks such as TPC-A provide solid, base-level comparisons in specialized environments. They don't reflect the complexity of most users' business needs and processing workloads. Therefore, they have limited value in making realistic buying decisions.

To help IS management better predict the true cost of computing, International Data Corporation (IDC) developed a "cost-to-use" model. This model is intended to more-accurately measure and compare the full costs of using four types of leading midrange systems in networked, enterprise-wide applications. The systems in the study were: IBM AS/400, DEC VAX VMS, HP UX, and NetWare LANs.

Contradicts Price-Performance Notions
IDC studied more than 150 commer-

cial computer installations in the United States. We interviewed more than 30 customers who have installed networked-enterprise systems to assess the full range of computing costs in complex, enterprise-wide environments. The model IDC developed from this research includes hardware, system software, application software, development-staff and operations-staff costs, and all overhead costs associated with remote-systems management performed by a central site over a five-year period.

The IBM AS/400, sometimes mistaken as a premium-priced product, emerges as the lowest cost-to-use system in complex, networked, enterprise-wide processing environments

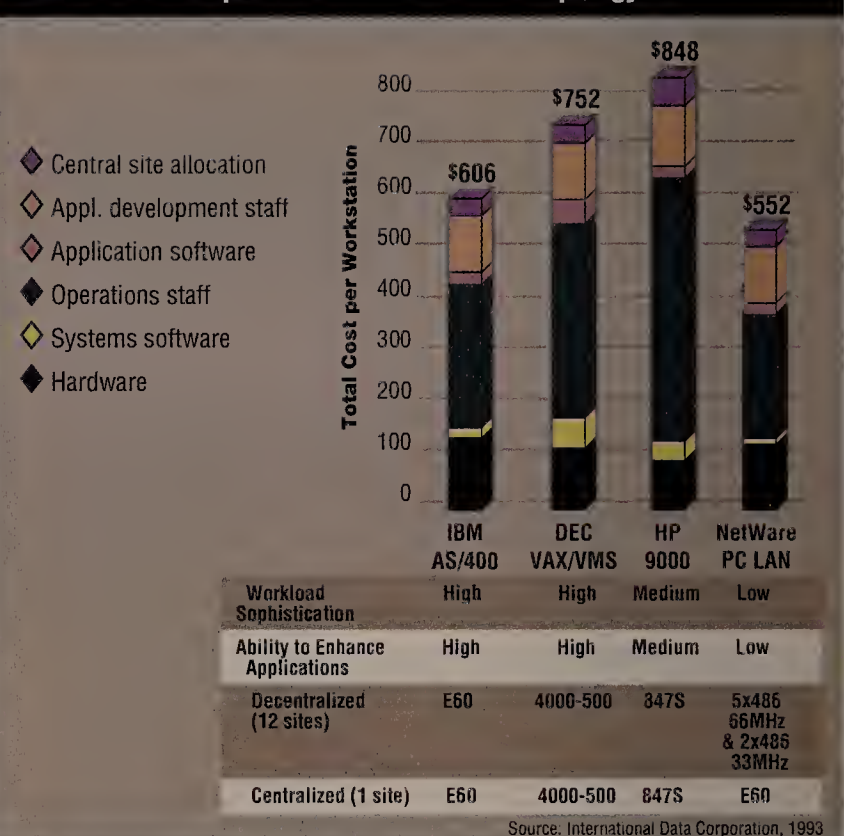
IDC believes the results of this study provide IS professionals with the best information available on the costs of processing in the most-complex type of computing environment, the networked enterprise. While we doubt that the results of the study will come as a major surprise to those who have fully considered the issues, our data contradicts notions based simply on hardware price/performance figures.

Options

Four major options appear to be available to PC LAN users.

1. Do nothing, and continue to live with existing distributed or decentralized topologies and functional-

Cost-to-Use Comparisons: Decentralized Topology



ity as they currently exist.

2. Wait for LAN vendors to deliver the needed functionality.
3. Add to operations staff, even though this will increase costs out of proportion to the increase in benefits.
4. Implement currently available technologies that provide the advanced functionality not yet available on LANs. While this may result in higher up-front costs, the IDC Cost-to-Use model indicates that this is the most-effective choice.

Staffing costs dominate

For example, consider the following:

- Integrated systems-management software services (a series of coordinated tools for administering local and remote systems) are a major differentiator for users because staffing expenditures dominate overall cost in the networked enterprise.

In a distributed topology, operations-systems staffs for IBM AS/400 and DEC VAX systems cost

\$36 per workstation per month, roughly a tenth of the cost of a LAN-based system. In a decentralized topology, as opposed to distributed, the reverse is true — LANs had the lowest costs for operations staff at \$244 per workstation per month. However, IDC believes these staffing costs are likely to rise during the next two years as the LAN-based applications mature and require reworking.

- Users — even IT professionals — generally lack experience with networked enterprise topologies. The logistics of distributing new software, software updates, physical and electronic support services, and hardware in a networked enterprise are viewed as a major barrier to success. As a result, few users are taking full advantage of the possible benefits of complex, distributed processing.
- The application set on LANs tends to be less-sophisticated than those on minicomputers. Development resources available for minicom-

Cost Components: Typical TPC-A Model vs IDC's "Cost-to-Use" Model

Component	TPC-A	IDC Cost-to-Use
Hardware	CPU, memory, disk/tape, terminals, 5-year maintenance	CPU, Memory, disk/tape, terminals/workstations*, maintenance, depreciation
System software	Operating system, runtime database, transaction processing monitor, minimal networking, 5-year software maintenance	Operating system, development database, system management tools, transaction processing monitor, compiler, robust LAN for mixed clients (terminals and PCs), 5-year software support
Operations staff	None	Manager, operators, technical support, specialists (PC, communications and security), help desk, administrators (DBMS and LAN), outside services
Applications software	None	Accounting, office automation, PC services, and support
Applications development staff	None	Manager, programmers (database, systems, and applications)

* Minicomputer-based topology included 60% PCs, 40% terminals. NetWare LAN-based topology included 100% PCs. Source: International Data Corporation, 1993.

Valuating Networked Enterprises

Information Business Systems

puters often are considerably more sophisticated than those available for LANs. In response to rapid changes in business environments, we believe that many LAN-based applications in networked enterprises will require significant reworking in the 1993-1995 time frame as the environments move from support roles (i.e. file, print, and electronic mail servers) to full-fledged production applications (OLTP, database, accounting, and data analysis) computers.

- The IBM AS/400, sometimes mistaken as a premium-priced product, emerges as the lowest cost-to-use system in complex, networked, enterprise-wide processing environments.

The IT industry is currently investing heavily in distributed computing — and rightly so. Distributing processing power while retaining overall cohesiveness is an outstanding strategy for achieving the most pressing objectives facing IT professionals today: organizational effectiveness, better return on IT investments, increased productivity, and more-rapid exploitation of new technologies.

However, distributed processing is

associated with significant complexity and uncertainty. Making the right decision requires higher quality, more-relevant information.

Conclusions

The information technology market is a very-complex place to shop. An expanding variety of hardware, software, and communications technologies, most associated with individual functional capabilities — that offer unique benefits — is being marketed by IT vendors to prospective and current customers. IT professionals demand better sources, quality and types of information to help them make the right decisions when planning purchases in this market.

Popular benchmark metrics such as TPC-A are specialized indicators of application performance (e.g. OLTP). As systems topologies get more complex, the appropriateness of this benchmark decreases dramatically. But TPC-C and the forthcoming TPC-D and TPC-E benchmarks will provide significant advances.

Users are exploring more-complex topologies as they attempt to support more-complex business strategies. The distributed enterprise and the decentralized enterprise, although

Two Types of Networked Enterprises

Type	Number of networked sites (+1 central site)*	End-user devices per site*	Primary objective	Best fit	Example
Distributed	115	16	Reduce operational costs by centralizing support and minimizing local IT resources	Multiple units, similar competitive conditions	Branch offices or franchises
Decentralized	12	150	Maximize operating unit flexibility, minimize infrastructure costs	Multiple units, dissimilar competitive conditions	Consumer goods or manufacturing

* Site size and end-user populations based on survey data. These qualities are used as the basis for all distributed and decentralized analysis. Source: International Data Corporation, 1993.

more complex relative to traditional host-based, fully centralized configurations, are especially attractive to many companies. Comprehending options in these more complex settings, however, requires special costing tools.

IDC applied its Cost-to-Use model to help users better understand trade-offs between alternatives. From our research, the following conclusions emerged:

- Overall costs-to-use in networked enterprise are very dependent on staffing levels. Superior systems-software services allows users to minimize staffing levels at remote sites without also minimizing IT support and responsiveness.
- IBM's AS/400 and Digital's VAX VMS systems, largely because of their advanced system-software capabilities, are more attractive alternatives to LANs in sophisticated, networked OLTP enterprises. Moreover, our research indicates that IBM's AS/400's cost to use is superior even to Digital's VAX VMS offerings.
- The Hewlett Packard 9000 offered superb price-performance overall, and is in an excellent position to attack costs of complex topologies and staffing issues. Its vulnerabilities are in applications software when distributed and in system software. In decentralized topologies, HP displays a lack of sophistication in system- and network-

management tools relative to IBM and DEC as the environments are scaled toward a larger population at a smaller number of sites.

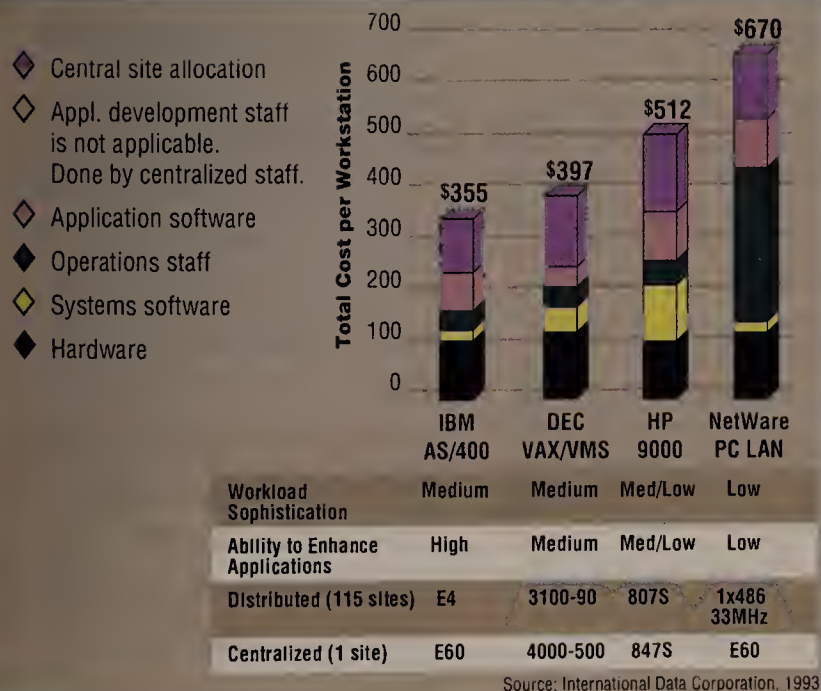
- As customers gain more experience with complex, networked enterprise topologies, they will (1) become more familiar with the logistics and politics of choosing, implementing and managing complex topologies, and (2) they will deploy these complex topologies more often.

Although we feel that the functionality of UNIX and LAN alternatives will increase over time, customers looking to take advantage of the benefits of networked enterprise topologies should strongly consider more integrated alternatives.

- Many users with LAN-based, decentralized enterprise topologies will be forced to choose between continued reliance on aging, less-sophisticated applications — and the potential competitive disadvantages implied by that choice — or greater staffing costs to rework and maintain their code base. We feel that they will have to choose more staff, despite the added costs, if they retain these topologies.

For a copy of the complete report, "Cost-to-Use of Midrange and PC LAN Systems in the Networked Enterprise," call 1-800-765-0119.

Cost-to-Use Comparisons: Distributed Topology



TRENDLINES

A CHANCE TO WIN YOUR VERY OWN MUG (SHOT)!

The creators of information technology envisioned it as a force for good. But alas, every so often a programming genius will turn his or her powers to the dark side.

The press recently reported on the case of an innocent-looking ATM (or an ATM machine as those in the redundancy brigade insist on calling it) installed in a Connecticut shopping mall by evil-doers with designs on shoppers' bank-card numbers. Cardholders who tried to use the ATM received only re-

ceipts saying no transactions were possible; meanwhile the machine recorded their PINs. The obviously IT-savvy thieves then encoded the stolen numbers on counterfeit bank cards and used them to withdraw about \$50,000 in cash from legitimate ATMs around Manhattan.

Such fraud is not only illegal and

morally reprehensible, it is also downright ingenious. This caper leads us to wonder whether any of our honest, ethical readers could devise a fiendishly clever method for turning programming prowess into ill-gotten gain. While *CIO* would never encourage our readers to do anything wrong, a little theo-

retical larceny never hurt anyone.

So we invite you to send your suggestions for an innovative IT-related criminal enterprise to Trendlines, *CIO* Publishing, 492 Old Connecticut Path, P.O. Box 9208, Framingham, MA 01701. The most originally nefari-



ous entry will be published, and the winner will receive, as always, one of our coveted *CIO* coffee mugs. Beta-testing is strongly discouraged. ■

QUIBBLES ON QUALITY

While the concept of quality continues to bestride the business world like a colossus, many executives are losing faith that quality initiatives will have any effect on their bottom lines.

In a survey of 200 CEOs by consulting firm R.D. Garwood Inc. in Atlanta, 39 percent of respondents who had a quality program in place said they had not achieved the bottom-line financial results they expected. In addition, 57 percent said that money spent on seminars and classes to further their quality initiatives had produced no direct financial results.

An overwhelming 99 percent said they had spent too much time and money on quality-related employee education in the last two years—although 89 percent anticipate continuing employee education in quality management.

The feeling seems to be increasing that quality programs, many of which focus on soft issues such as employee empowerment and team-building, "are not connecting with specific business problems," said Don Rice, a consultant with R.D. Garwood. Rice argues that quality efforts should be redirected toward achieving hard benefits that can be implemented and measured, such as on-time scheduling and inventory reduction. ■

REBUILDING L.A.

SIMULATED URBAN RENEWAL

After suffering heavy damage in the riots that followed the trial of police officers charged with beating Rodney King, South-Central Los Angeles has taken on a new life—in simulation. Researchers with UCLA's Graduate School of Architecture and Urban Planning (GSAUP) have developed a three-dimensional simulation of 80 blocks of the riot-devastated area that allows city planners and neighborhood activists to visualize effective ways to rebuild.

The simulation—created by Bill Jepson, director of computing for GSAUP; Robin Liggett, a professor of architecture and urban planning; and Paul Ong, associate professor of urban planning—allows viewers to drive, walk or fly down a street, noting such details as trees, shadows, rubble, debris and color variations. Users can then view the same street again, this time seeing how it will look if development plans are carried out. By translating abstract blueprints into 3-D images, Jepson believes, neighborhood residents

and city administrators will gain a better feel for development plans—and be able to better express any concerns before construction begins.

Jepson, Liggett and Ong developed their simulation system on a graphics computer on loan to the school from Silicon Graphics Inc., of Mountain View, Calif., using geographic information system software and visualization tools. Graduate students armed with 35mm cameras collected pictures of every building in the area, which were scanned into the system.

The system also contains demographic information. For example, users can prompt the system to identify all liquor stores within 500 feet of a schoolyard; the system will display them in red. Users can also determine how traffic patterns will be affected by a new supermarket or if residents possess the skills to fill jobs created by a new business.

The researchers are seeking funding from the city for a second simulation: a 250-square-block area known as Pico-Union, which was also heavily damaged in the riots. (They need a graphics computer; Silicon Graphics has reclaimed its \$250,000 loaner.) This time, students will use video cameras rather than 35mm still photographs to build the simulation, and Jepson is looking at software from TRW Inc. that may allow the use of aerial photographs. Eventually, he'd like to build a simulation of all of Los Angeles. ■

Only one thing can turn your global network from a burden to an asset.

A Partner.

Outsourcing with Syncordia lets you mind your business better.

A multinational communications network should be an asset that builds your business. Not a burden that bogs you down, distracting you from your core business.

That's why you need a partner.

Outsourcing with Syncordia lets you do what you do best.

Syncordia has a better way to manage your global network. Outsource it with us.

Outsourcing gets you out of the business of building and managing global networks and allows you to redeploy people and assets against the business your company was formed to pursue in the first place.

With us as your partner, managing complex global networks isn't so complex, because that's the business we were formed to pursue.

Most important, to us, partnership means pursuing opportunities, not just solving problems. We'll make it our business to know your business and help you use information technology to get an edge over the competition.

We're part of BT.

Syncordia is the first company built from the ground up to provide global network outsourcing solutions.

We are part of BT, one of the

world's largest and most advanced telecommunications companies. So we have access to the worldwide resources, technical prowess and local market knowledge of our parent company, and retain the entrepreneurial agility to customize solutions for your business.

Not just the first, but the finest.

Syncordia outsourcing solutions range from planning and integration through procurement, installation and maintenance to the operation of your entire network.

In all cases, we guarantee the highest level of customer service through Network Control Centers armed with Concert™ network management software; Customer Support Centers, staffed with multilingual, multicultural managers; and Integrated Single Currency Billing.

The Syncordia Service Level Agreement spells out every detail of what you can expect from our partnership. It defines the shared risks and rewards.

Call us, before your competition does.

Outsourcing your global communications network takes time. And teamwork. All the more reason to begin right away. Because the sooner we become your partner, the sooner your network burden will become a business asset.

For more information on Syncordia, in the U.S. or Canada, call 1-800-477-5355.

SYNCORDIA

Let us help you mind your business.

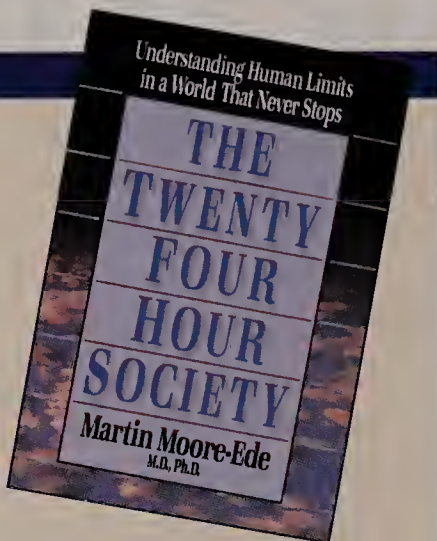
Syncordia is a subsidiary of British Telecommunications plc. **BT** 

TRENDLINES

OFF THE SHELF

THE TWENTY-FOUR-HOUR SOCIETY

By Martin Moore-Ede
Addison-Wesley (Reading,
Mass.), 1993
230 Pages, \$22.95



One of the highlights of this year's Big Apple Circus, a traveling purveyor of small-top entertainment, was a Mongolian contortionist who did things with her body that no human body was designed to do. Today's nonstop world, in which businesses operate around-the-clock, forces workers to perform comparable physiological feats: remaining awake for unnaturally long stretches or delivering peak performance when their biological rhythms dictate rest. According to Martin Moore-Ede, author of *The Twenty-Four Hour Society*, industry's failure to make allowances for human limitations "can only increase the risk of catastrophic human error."

When Moore-Ede uses the word "catastrophic," he isn't talking about a couple of million dollars lost from the bottom line. Three Mile Island, the Exxon Valdez, Chernobyl, —the most serious industrial accidents of the last two decades occurred when the people with hands-on responsibility were fatigued. NASA officials made the decision to launch Challenger after working 20 hours straight. And the crew of the USS Vincennes was suffering from stress and exhaustion when the cruiser blasted a civilian airplane out of the sky.

"The increasing reliance on automation and on 24-hour-a-day production pulls the most critical employees in the producing economy into a world for which their

bodies were not designed," writes Moore-Ede. The problem, he argues, is that we invest millions in sophisticated, potentially dangerous machinery, then hire humans to monitor that equipment without putting any safeguards in place to monitor the humans.

As a result, "the reliability of machines has grown enormously...while human reliability has tended to decline. Creating and installing a human-centered technology to redress the balance will be one of the most important challenges of the 21st century."

The author's blueprint for a human-centered workplace includes technologies for monitoring alertness, systems that modulate lighting and temperature levels, and facilities for intervals of rest. He calls on organizations to adopt the principles of human-centered management: "the process by which technology and facilities are made fully supportive of human physiological and psychological needs, so that human creativity, efficiency, safety and health can flourish while the other benefits of technological innovation are fully exploited."

Frequent fliers and people who live near nuclear power plants may find *The Twenty-Four Hour Society* an uncomfortable read. But it is a crucial reminder for executives who go home at the end of the day that while their organizations may not sleep, their employees must. ■

A BENCHMARKING OPPORTUNITY

If you want to know how your data-center operations stack up against those of some Fortune 1000 companies, the results of an annual study conducted by Nolan, Norton & Co. in Boston should give you some insight.

The Data Center Baseline Update Program provides competitive benchmarking information on data-center productivity and efficiency. Participants in the 1993 update included Chase Manhattan Bank, the City of New York and Pratt & Whitney. Judging from the findings, major trends include consolidation, downsizing and decreased spending.

As a result of consolidation, the median data-center workload has increased 67 percent, even while data-center staffing has decreased by an average of 8 percent. Continued advancements in technology account for this apparent contradiction. Total data-center spending is off by an average of 5 percent, while overall technology spending dropped by 7.5 percent, with large data centers experiencing the greatest reductions.

Nolan, Norton has been collecting operational and demographic data from mainframe-based data centers since 1981. ■

ON THE (CRIMINAL) RECORD

It might be a better story if Gerald Latchinian was doing time for robbing a McDonald's. In fact, the civil engineer was serving the first part of a 30-year sentence for racketeering when he came up with the idea for an automated, tamper-resistant cashier system to replace checkout clerks at fast-food outlets.

While there is a long tradition of music and literature being created behind bars, Latchinian's invention may be the first IT solution dreamed up in the slammer. The system features a touch-sensitive screen that customers use to place orders, pay and receive their change; the system then sends the order to the kitchen. *The New York Times* recently featured Latchinian's product in its "Patents" column, together with a telephone interview from the federal prison in Oxford, Wis.

Latchinian told the *Times* that while working in the food-services department of the penitentiary, he got the idea for a restaurant "shaped like a 94-foot-high egg, at the center of which are two cooks in a yellow yolk. But there was no space for cashiers except at the entrance." When he found out that automated cashiers didn't exist, he decided to design one, using vitamin-bottle caps and the backs of notepads calibrated with tape because he was not allowed to have drafting tools.

The system includes an ink canister designed to erupt if anyone fools with the money tray. To test this safety mechanism, Latchinian gave the specs to five safe-crackers in the prison. None could break into it.

Perhaps other inmates will follow Latchinian's lead and spend their terms creating code instead of license plates. It could be the next wave of pen computing. ■

Imagine upgrading
your printer
with just one of these.



QMS is leading the way to a new era in seamless network printing with its Crown™ print system family. Now, your QMS® print system can keep pace with the technologies of the future with simple, cost-effective updates. The QMS 2025, QMS 3225, QMS 4525 and the QMS ColorScript® Laser 1000 already use software loadable system technology, so it's easy to enhance and upgrade them via diskettes. And all QMS print systems utilize Crown multitasking technology, which allows them to receive, interpret, compile and process multiple documents simultaneously while yet another document prints. QMS print systems work with a broad range of system platforms and connect directly to all major network environments. So choose the QMS print system that's right for your needs today with adaptability that defies obsolescence.

Whatever your needs, QMS has the right print system to grow with your company:

QMS 860 Print System—true 600x600 dpi on up to 11x17/A3 for those who require the most detailed spreadsheets or graphics.

QMS ColorScript® 210—great, affordable color business presentations.

QMS ColorScript 230—the perfect 11x7/A3 printer for graphic design environments of any size.

QMS ColorScript Laser 1000—color/monochrome laser printing for total flexibility in business and technical environments.

QMS 1725 Print System—price/performance and mixed network capability for any size business.

QMS 2025 and QMS 3225 Print Systems—paper handling, connectivity and printing speed for larger departments.

QMS 4525 Print System—the most cost-effective choice for document and on-demand printing where sorting, finishing and forms capability are a must.

QMS has resellers worldwide to provide products, service and support for you and your growing needs.



For the reseller nearest you,
call 800 832-7250 or
205 633-4300.

QMS, the QMS logo, Crown, the Crown seal and ColorScript are trademarks or registered trademarks of QMS, Inc. All other product and company names are registered trademarks of their respective companies.

*Developer tested only. Novell makes no warranties with respect to this product.

Information Preservation

A data warehouse provides an integrated source of timely, historically accurate data for informed decision-making

BY JAMES W. ASHBROOK

A large insurance company that had acquired several other firms—all with their own data systems—offered several types of policies, including life, health, disability, liability and maritime. The data on these policies was spread out across multiple systems and databases. When a new vice president of marketing wanted to know how many active policies the company had, he was told it would take 18 months to two years to obtain the answer, by which time the information would be meaningless. In this instance, management was unable to obtain decision-support data in time for it to have any impact on the operation of the organization.

This company and many others are seeking solutions to this problem in the concept of the data warehouse—a database of information structured for decision support. A data warehouse can help companies with business forecasting, market research, cross-selling and human-resources management. For instance, a PC manufacturer could determine

sales of specific machines by distribution channel and time period (sales of 386 PCs through direct marketing in a week). This three-dimensional spreadsheet helps the company make decisions on how to load its factories and direct its sales force.

The need for a better method of gathering and maintaining decision-support data is driven by two conditions. First, the operational environment provides no historical perspective for use in decision-making. For reasons of space limitations and to maintain performance levels, most transactional systems do not keep records for very long—usually no more than 30 to 60 days. The other condition relates to the diverse computing environments that have evolved in many companies.

To use transactional data for decision support, someone must locate and extract the appropriate data, verify it, summarize it, integrate it with data from other sources, organize it for a specific purpose and move it into a database where it can be easily and uniformly accessed by the people who need it. And the whole process must be repeated every time an analysis is performed; this is both expensive and inefficient.

In diverse, unarchitected environments, this requires considerable processing. And departments frequently use different data to perform the same analyses. The results, needless to say, conflict. Yet there may be no way to create an audit trail to discover the source—and therefore the reliability—of data that could be based on extractions of extractions of extractions.

The data warehouse enables decision-support analysts to easily compare timely data in a historical context from different operational sources with minimal pro-

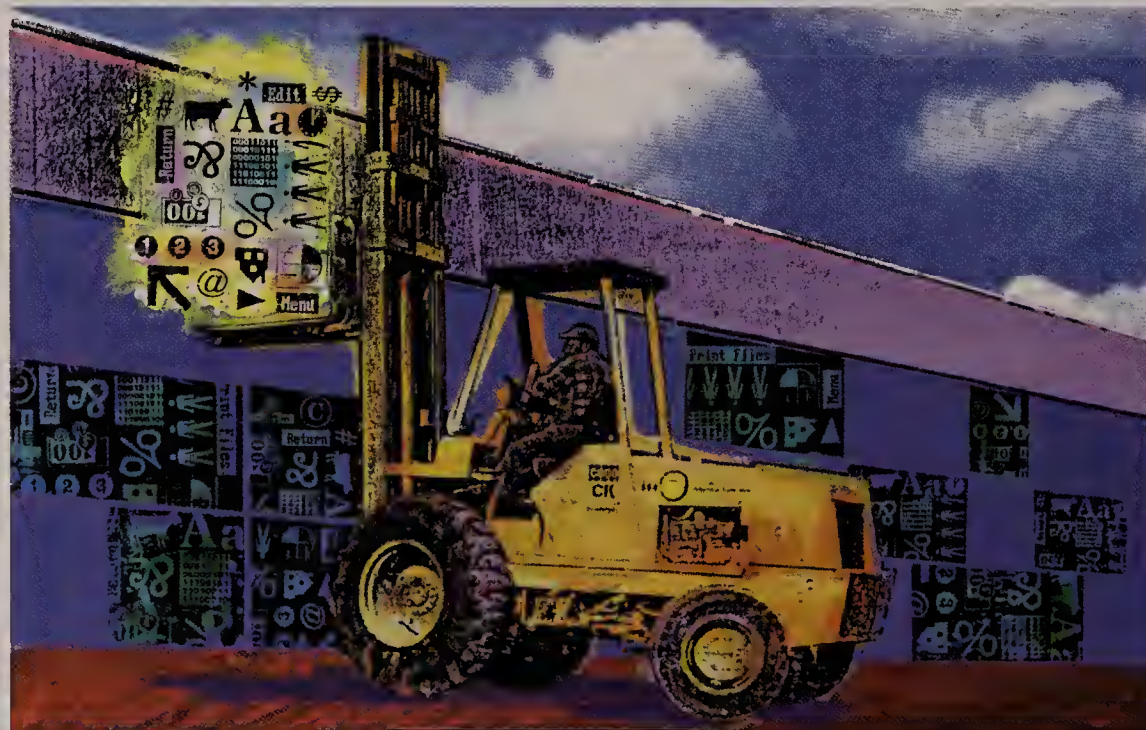


ILLUSTRATION BY ALAN MAZZETTI

With AT&T SDN, out of the office doesn't mean out of the loop.

SDN, AT&T Long Distance Service for large companies, lets every employee stay in touch with voice mail. Even if they don't have an office.

With AT&T SDN (Software Defined Network) Voice Mail Service*, your business gets a comprehensive, nationwide communication *system* that lets everyone in your company—from the sales manager to the truck driver—communicate with everyone else. In a way traditional voice mail and answering machines can't match.

For example, SDN Voice Mail Service lets you send a message to several employees simultaneously, across the hall or across the country. You save time, they save time, *everybody's* more productive—because now you're working as a well-informed *team*. And, of

course, the information flow goes both ways: your employees can record, edit, send, receive and store messages wherever they are. So they can always be in touch with vendors, customers and *you*.

And because SDN Voice Mail Service is built right into your SDN network, there's no need to buy additional hardware or software. A definite advantage—as is our competitive price.

If your company spends \$30,000 or more per month on outbound long distance, consider AT&T SDN. With the voice mail service that gives *everybody* a voice. For more information, call your AT&T Account Executive or 1 800 443-4SDN, Ext. 803.

AT&T. The Best in the Business.SM

©1993 AT&T

*AT&T SDN Voice Mail is an optional feature of SDN.



cessing. And because it provides easy access to data throughout the organization, more departments are likely to employ decision-support analysis to make critical decisions.

The data warehouse provides the architecture to model, map, filter, integrate, condense and transform data into meaningful information that can be accessed, analyzed and acted upon. It keeps track of the data's source and its target table within the database, with a time stamp to ensure that users compare apples to apples. (For example, a company tracking its U.S. sales would need to know that up until 1991, Canada was included in the U.S. category but since then has been grouped with international sales.)

Contrary to what many believe, there is little data redundancy between the operational and the data-warehouse environments. Data-warehouse data is filtered based on predetermined selection criteria (sales of certain products to people living in a particular area, for example). The filtered data is then summarized over a time horizon—weekly summaries over two years, for example—and focused and integrated with other data as it moves into the warehouse. Because the data warehouse assures that everyone is using the same data at the same level of extraction, it eliminates conflicting analytical results and arguments over the source and quality of the data used for analysis.

Data in the data warehouse is characterized by four attributes that distinguish it from the operational environment:

It is subject-oriented. Operational data is organized by process or transaction; in a bank, applications are organized around checking accounts, savings, loans, credit cards, etc. Contrast this with the data warehouse, where data is organized around major subjects such as customer, vendor, product and activity. Since the data warehouse is not used for functional processing, it is not necessary to store data at a fine level of granularity, but only at a level sufficient to support information analysis.

*An analysis can
always be repeated
because data may be
added to but is seldom
changed.*

It is integrated. Data is integrated, with consistent naming conventions, measurement of variables, encoding structures and so on. Integration issues affect almost every aspect of data-warehouse design because data must be stored in a singular, globally acceptable and recognized form, even when the underlying operational system stores it differently.

It provides historical perspective. Data is accurate as of specific moments in time and is described as "time-variant." It is, for all practical purposes, a series of snapshots taken over a long time horizon. This historical perspective makes it possible to analyze and forecast trends.

It is not volatile. Operational data changes constantly, and for space and performance reasons, a limited number of transactions are maintained. When data from transactional records is used for analysis, it often cannot be traced or repeated. Analysis derived from data-warehouse data, on the other hand, can always be repeated because data may be added to but is seldom changed.

Determining the cost of obtaining decision-support information is difficult. First, one must consider the hard costs: hardware, software, license fees, computer support, application development, systems support and maintenance.

The soft costs are more difficult to determine: the elapsed time required to obtain useful information (if it takes too long, some answers are not worth getting); testing of data and analytical methodology; the impact of the data retrieval and data processing on current operating systems. If an organization cannot get the information it needs to make informed decisions in time to make

a difference, then the cost of its current methods of obtaining relevant data is too high.

The costs of implementation include the cost of programming staff and resources, and the impact it will have on current processing systems. Building a data warehouse without automation tools is a labor-intensive process. Fortunately, it is ideally suited for incremental development, so the initial impact on resources is minimized. After one or two iterations of development, the corporation can look at the results achieved and determine whether further investment is justified.

Automation tools can speed the process considerably. They enable construction of a prototype within days, so measurable results are almost immediately available. And they boost productivity immensely by automating the extraction and integration of data, the generation of code, and the creation and maintenance of meta data (information about the data in the warehouse, including its source and target tables, the mapping involved, the transformations that were done to it as it was moved and a historical record of any changes to its definition). Such tools greatly simplify maintenance, and generic data models can eliminate the need to develop models from scratch.

Automated tools provide productivity gains of 10 to 100 times over manual development. Generally, creating a data warehouse manually takes from six to 12 months; with automated tools, that time can be cut to a few weeks or a few months, depending on the scope of the project.

More important than even the productivity increases, however, is the ability to make intelligent business decisions more quickly and with confidence that the data is timely and accurate. This provides the real brass rings: improved customer service and a stronger bottom line. ☐

James W. Ashbrook is president of Prism Solutions Inc., a software company providing tools and services to build and maintain data warehouses, headquartered in Sunnyvale, Calif.

How Does One Overnight Delivery Service Guarantee Overnight Success?



Rush. Immediate. On-time. Those are the dictates of the delivery business. Yet Guaranteed Overnight Delivery, Inc. manages to keep up with an extremely demanding schedule

The Answer is ARDIS.

with the help of the ARDIS nationwide wireless communication network.

Before ARDIS, dispatchers tried to reach drivers on beepers and had to wait for them to find a pay phone to call back. Now, drivers carrying handheld computers are in constant contact with fleet headquarters, wherever they are. So dispatchers don't waste valuable time trying to track down drivers, and drivers have more time to make deliveries. In addition, customers can now receive real-time information about the status of their deliveries.

"With ARDIS, our drivers now average 45 minutes of additional time each day, or two-to-three extra stops per truck. And our customers get answers, not excuses."

— Walter Riley,
President,
Guaranteed Overnight Delivery, Inc.

That's just one example of how real-time information solves real-life business problems. For wireless expertise in data communications, network management, application development, systems integration and more, call 1-800-662-5328, ext. 400.

ARDIS

*Real-time information solutions for
real-life business problems.*

ARDIS is a partnership of IBM and Motorola





DIVIDE AND CONQUER

Once considered viable only for scientific and engineering applications, massively parallel processing is increasingly the choice of commercial companies that have pushed their existing architectures as far as they can go

Two years ago, Neodata Corp., a multinational direct-marketing company based in Dallas, found itself pushing the limits of what was possible using traditional computer architectures. It literally had nowhere to go. Yet information processing was the foundation of Neodata's worldwide activities.

As the provider of a broad range of telemarketing and other services, Neodata processes more than 1 million pieces of incoming mail a day, and its outbound mail accounts for 2 percent of the daily load of the U.S. Postal Service. It receives more than 3 million telephone calls and handles more than 13 million transactions every month. Chances are, if you subscribe to a major English-language magazine, your name and address are in a Neodata database.

Yet Neodata's traditional host-based architecture was increasingly unable to handle this processing load. By the end of 1990, Neodata knew it needed to make some radical changes.

BY ALICE LAPLANTE

Radical indeed. Neodata is one of the first companies in the non-engineering commercial sector to make massively parallel processing (MPP) the foundation of its long-term IS strategy. Not content to continue building and maintaining myriad operations databases—none of which “talked” to one another—Neodata is combining all operational data into one relational system. This will enable more efficient order fulfillment and, once the project is complete, allow Neodata to make complex queries across all existing data, enhancing its ability to target direct-mail campaigns.

“Today our databases are geared toward the fulfillment operations of our customers,” said Pete Estler, di-

“We could have gone to the next-larger Data General box—which would have improved our performance 20 or 30 percent—but ultimately we would have outgrown that as well.”

—Dave Barrett

rector of information technology strategy and chief architect of Neodata's Customer Oriented Relational Environment (NCORE) project. “[These databases] can't distinguish between the Pete Estler who subscribes to *Sports Illustrated* and the Pete Estler who subscribes to *DBMS* magazine. My name is on both lists, but Neodata has no idea that I'm the same person—and no way to make effective use of that data.”

Neodata knew that the ability to make better use of the data it habitually collected and stored for operational reasons was well beyond any mainframe. And even the most advanced client/server configuration would lack the storage and I/O capacity to process the terabytes of

data that already existed in the company's systems. Neodata decided to sign up systems integrator EDS to develop an MPP solution.

PREVIOUSLY CONSIDERED viable only for scientific and engineering applications, MPP systems are moving into the IS mainstream. Other early MPP adopters include INVESCO Funds Group, American Express Co., American Airlines Inc., Prudential Securities and Kmart Corp. What these firms share are decision-support or online transaction-processing (OLTP) needs too immense for even the largest and most powerful mainframes.

MPP computers incorporate hundreds—if not thousands—of processors in a single computer. In effect, MPP technology works by “dividing and conquering” data-processing problems: Parallel microprocessors separate a large job into many smaller ones, executing them simultaneously for more efficient—and cost-effective—processing (see “Souped Up Supercomputers,” *CIO*, July 1991).

Critical to MPP's appeal is its scalability. Most MPP systems allow you to start modestly and expand as needed. “If you need more horsepower, simply add more CPUs, disk space and memory,” said Dick Johnson, a principal with Booz, Allen & Hamilton's MPP Practice in Vienna, Va.

Thanks to these qualities, the MPP user base is expanding. “First we saw oil companies turn to MPP for their seismic data analysis; then we saw the automotive and pharmaceutical industries follow with scientific and engineering processing,” said Scott Miller, director of supercomputing applications at consultancy MRJ Inc. of Oakton, Va. “More recently, insurance companies, banks and credit-card companies are beginning to acquire MPP technology to handle the large amounts of data and transactions they must process hourly.”

Two things are making it possible for mainstream corporate IS shops to take advantage of MPP's power. First, the machines are increasingly built using off-the-shelf micro-

Risky Business

.....
Early adopters of MPP find it's smart to hedge their bets

Are there risks to being an early massively parallel processing adopter?

Absolutely, said Bob Fetter, vice president of business development at Dallas-based direct-marketer Neodata. But Neodata is minimizing risks with a firm commitment to open systems. “We're not married to [vendor] Kendall Square Research,” said Fetter. “Because we've gone with a Unix-based application, we're free to move our databases to other hardware solutions.”

In addition, a “contingency plan” ensures that if critical MPP technology is not delivered on time and with the expected reliability, Neodata can put its huge Oracle databas-

processor technology that enables standard software languages and applications to be ported over and integrated into a true open-systems environment.

Secondly, major software vendors are finally making applications available on MPP platforms. Oracle Corp. has ported its Oracle7 DBMS software using industry-standard Structured Query Language commands in a client/server architecture to a number of key MPP architectures. Texas Instruments Inc. and other CASE vendors are doing likewise with software-engineering tools. As a result, Minneapolis-based market-research firm the Smaby Group Inc. expects commercial sales of MPP machines to reach \$911 million by 1996.

Commercial-sector applications fall into two principal categories: accessing and managing huge databases in real time for better decision support; and higher-capacity OLTP

es on clustered nodes of sequential multiprocessing machines, such as Sequent, RS/6000 or Pyramid workstations. "They aren't as scalable as MPP machines, and we can't achieve the kind of real-time processing for operational and decision support," said Pete Estler, chief architect for Neodata's Customer Oriented Relational Environment (NCORE) project. "But it's an interim solution."

The first commercial buyer of a Thinking Machines Corp. MPP supercomputer, consultancy MRJ Inc. of Oakton, Va., provides customers with early prototyping of MPP solutions, demonstrating the technology's potential for solving data-processing problems. Scott Miller, MRJ's director of supercomputing applications, said early commercial MPP users face significant risk in two categories.

First, "most of the technology is coming out of new and small companies," said Miller. "There's always the chance they won't make it." Corporations are thus understandably nervous about buying into a particular vendor's technolo-

gy. As more established vendors step into the market, this will change.

The second major risk: "We're talking about very large installed software bases, and that software has to be converted," said Miller. "This is very expensive and requires expertise that the typical IS shop doesn't have." Then there are support and maintenance issues. "Even the third-party market lacks an abundance of these skills in the MPP environment.

"Benchmarking and prototyping are a critical part of MPP development," Miller continued. "Vendors are promising wonderful products that are presumably right around the corner. But don't necessarily believe these promises."

Some consultants offer the opportunity to prototype applications on their MPP systems without an up-front investment in hardware and software. "Many commercial MPP customers [want to] try before they buy," said Dick Johnson, a principal with Booz, Allen & Hamilton in Vienna, Va. "People still view it as something esoteric that belongs in the laboratory." —A. LaPlante

applications, such as airline reservations and financial modeling.

Neodata will use its MPP-based architecture for both. At the heart of NCORE is a fully relational, on-line system that provides immediate, real-time access to all customer data. Operational databases and decision support will be combined in one massive system. Neodata has chosen hardware from Kendall Square Research Corp., combined with Oracle7 relational-database technology that was specially ported for this project by the vendor. Indeed, Neodata could not have gone with an MPP solution if Oracle had not agreed to act as a partner in the project, said Bob Fetter, vice president of development for NCORE.

In addition, major efforts by Texas Instruments and a host of other vendors in the open-systems arena—many of which are considering porting their technologies to an MPP

environment—were critical to the success of the Neodata project. This is where EDS came in. "It took a big industry player to coordinate this effort," Fetter said. "EDS has to pull a lot of strings."

EDS's Estler, who is on-site at Neodata's Boulder facility for the duration of the project, said that he had "six EDS presidents intervene on my behalf to make sure these partnerships came through on time." Oracle ported Oracle7. Texas Instruments ported its IEF CASE tool. And the EDS group based in Detroit added its expertise in MPP systems used in scientific applications at General Motors.

ANOTHER COMPANY whose processing needs rapidly outstripped its existing systems is Denver-based mutual-funds group INVESCO. Having experienced tremendous growth over

the past three years, INVESCO is finding it increasingly difficult to predict its future information-processing requirements. Understandably, the company is nervous about committing to an IT architecture that can't keep up with its business.

When its growth spurt started, INVESCO had two Data General Corp. minicomputers running homegrown Cobol applications to handle shareholder accounts, portfolio manage-

MPP manufacturers—
particularly those using commodity microprocessors—are dropping prices into the \$100- to \$300-per-megaflop range.

ment and accounting, personnel, and payroll processing. None of these applications were integrated, and in many cases, duplicate data had to be reentered manually into more than one system. "Our computing platform was being taxed very heavily in trying to keep pace," said Dave Barrett, vice president of information technology.

Barrett began investigating alternatives, with his top priorities being flexibility and open systems. He decided to contract with consulting firm SuperSolutions Corp. in Minneapolis to design a single, integrated database for all data stored by INVESCO, using the Oracle relational database management system.

Although INVESCO is considering moving to Oracle7, the current version of its database is being written in the "parallel" version of Oracle version 6.036. The database runs on an NCR 3600, which can be expanded to hold up to 288 microprocessors. Because the NCR 3600 wasn't available at the time the project began, INVESCO brought in an "interim" machine—the NCR 3550—and used a Cobol interpreter from WildHare Computer Systems Inc., running under Unix 5.4, to convert

A Double Major

At Arizona State, MPP is being applied to both scientific and administrative computing

Bill Lewis, director of academic and communications technology for Arizona State University (ASU) in Tempe, is responsible for two kingdoms of information processing: scientific and engineering research, and administrative and academic computing. Recognizing that base hardware and software investments could be substantially reduced if the same machine ran both types of applications, Lewis turned to a massively parallel processing solution.



Currently, ASU's architecture is mostly based on IBM and Digital Equipment Corp. host systems running proprietary databases that are inaccessible to most university users. The goal is to open these databases to PC and Macintosh users via client/server technology based on open systems.

ASU's lease on a Cray XMP18 supercomputer for scientific and engineering applications was set to expire in late 1992. The annual cost of the lease was \$700,000, plus \$250,000 a year for maintenance. ASU's strained budget would not allow for a continuation, so Lewis purchased a MasPar MPP system and networked it to a series of IBM RS/6000 workstations. Buying the machine outright cost just \$130,000; eight months later he upgraded to a MasPar MP-2 at a cost of \$450,000, bringing the total cost to nearly \$600,000 (plus \$45,000 a year for maintenance). And, depending on the application, performance was two to three times that of the Cray.

This started Lewis and his colleagues thinking: Could such cost-effective power be harnessed for more traditional database applications?

"We began to consider that if we could get some of our major databases—which currently reside in Oracle and Sybase—ported over, that MPP would also be a feasible architecture for transaction processing and decision support," said Lewis. "The problem is that porting more traditional database engines hasn't yet caught up with MPP hardware."

ASU is experimenting with making its MasPar system a host for a new data-warehouse project being piloted on a Sun Unix server using Sybase. "We're going through the bidding process to determine our future DBMS vendor," Lewis said. "What might determine the winner is whether that engine can eventually be ported over to the MasPar architecture."

—A. LaPlante

its existing shareholder system in just over 40 days.

"This gave us enough breathing room to operate in our existing environment until the new Oracle database was ready," Barrett said. The 3600 was delivered in August 1992. As of Jan. 1, the first two pieces of

the Oracle database were live and operational.

Like Neodata, INVESCO's massive data-processing requirements limited its options, said Barrett. "We could have gone to the next-larger Data General box—which would have improved our performance 20 or 30

percent—but ultimately we would have outgrown that as well." The performance benefits of the NCR system have been dramatic. Updating the mutual-fund accounting database used to take eight to 12 hours in batch mode; now that same task takes approximately an hour and a half. Smaller batch jobs that formerly took 10 to 15 minutes now take less than one minute.

More importantly, INVESCO now has room to expand even further. "We have no way of knowing what our future growth rate is going to be," said Barrett. "We may need to continue expanding, and we don't want to be held back by lack of processing capacity."

IN ALMOST EVERY RESPECT, MPP systems are cheaper and more powerful than traditional mainframes or even supercomputers. Traditional supercomputing machines, such as the Cray series, cost more than \$1,000 per megaflop. But MPP manufacturers—particularly those using commodity microprocessors—are dropping prices into the

"Keeping this amount of data 'live' is not viable financially or any other way without MPP technology."

—Stephen Cone

\$100- to \$300-per-megaflop range.

Until recently, it's been difficult for MPP vendors to beat the competitive pricing of RISC-workstation vendors. But recent system introductions have changed that. "MasPar systems now offer lower cost-per-unit performance than the top workstations," said John Gustafson, a computational scientist at the Ames Laboratory at Iowa State University. In the past, clustering several multiprocessing workstations together via wide-bandwidth networking connections achieved many of the benefits of MPP without the pain of

From desktops to servers,
when it comes to integration
the best is about to get even better.

Because enterprise-wide
client/server solutions are
about to become a reality.

EXTENDING YOUR REACH
WITH INTEGRATION™



™ Trademark of Texas Instruments Incorporated
© 1993 TI 00-8281

IEEE™

moving to an entirely new architecture.

"Machines from IBM, HP and even Silicon Graphics are very fast; friendly; easy to compile, link and run; and they avoid a lot of the programming headaches of more unconventional systems," said Gustafson. "Yet they lacked the scalability and performance of true MPP systems. Now that MPP machines are more competitively priced, more commercial customers are interested."

supercomputer from Thinking Machines Corp. It has since developed software that enables clients to make more effective marketing decisions using the massive amounts of data it collects and updates. "Using all customer data to better track and predict customer behavior is a relatively new idea," said Epsilon Chairman Stephen Cone. "Yet it's infinitely valuable."

"Most companies, even when emphasizing distributed processing, still

computing. Add to this the challenge of symmetric multiprocessing, and you have a virtual jungle of training, retraining and hand-holding.

Neodata has tried to solve the training issue by "isolating" different aspects of the MPP project as much as possible. "We try to minimize the impact on our staff," said Estler. "For example, our database analysts need to understand how to use Oracle7 to break down a query and distribute it across many processors. They also have to understand how parallel loading and parallel indexing impact database design. Yet our programmers don't necessarily have to un-

MPP Vendors

COMPANY & LOCATION	PRODUCTS
Thinking Machines Corp. Cambridge, Mass. 617 234-1000	The top-of-the-line CM-5 Connection Machine holds up to 1,024 processors.
nCube Foster City, Calif. 415 593-9000	The 2E holds 8 to 128 processors, and the 2S holds 64 to 8,192 processors.
MasPar Computer Corp. Sunnyvale, Calif. 408 736-3300	The MP-1 and MP-2 hold up to 16,384 processors.
Kendall Square Research Waltham, Mass. 617 895-9400	The KSR1 family holds from 8 to 1,088 processors.
NCR Corp. Dayton, Ohio 513 445-5000	The 3600 family holds up to 288 processors. The NCR DBC/1012 Model 4 holds up to 1,024 processors.

GENERALLY, CANDIDATES for MPP have done as much as they can under their existing architectures and are making technology compromises that limit the effectiveness of knowledge workers. "If you have an application that you dread running because it takes so many cycles and causes so many jobs to wait in the queue, you should possibly consider MPP," said Gustafson.

One company facing such difficulties was Epsilon, based in Burlington, Mass. The American Express subsidiary designs, updates and maintains marketing databases; performs data modeling, analysis and consulting; and uses the data to put together more effective marketing and promotional campaigns for its clients.

In 1991, Epsilon purchased an MPP

need to maintain a large central repository of data," said Cone. He believes that instead of just pulling out "samples" of this data to run statistical tests, companies should consider modeling every megabyte. MPP technology is "absolutely critical to this."

Cone gave the example of an Epsilon client—a catalog company—with several terabytes worth of historical data. "It makes absolute sense to put this data online for customer-service and analytical reasons," he said. "But keeping this amount of data 'live' is not viable financially or any other way without MPP technology," he added.

Enthusiasts like Cone notwithstanding, many corporations are having enough trouble moving Cobol programmers to distributed client/server

"If you have an application that you dread running because it takes so many cycles and causes so many jobs to wait in the queue, you should possibly consider MPP."

—John Gustafson

derstand this. They're using the same skills they've used in other environments."

According to Gustafson, it's a mistake to think MPP is going to replace all conventional computing architectures. "But it will certainly act as a key supplement for those applications that overwhelm today's mainframe or even distributed solutions."

MRJ's Miller predicts that soon "second-tier" users, driven less by absolute necessity than by cost and performance benefits, will become interested in MPP technology. "And, of course, as the market expands, vendors will lower prices, and more commercial customers will be interested," he said. "The cycle has begun." □□

Alice LaPlante is a freelance writer based in Palo Alto, Calif.

FOUNDATION®



**FOUNDATION®...
proven client/server
applications,**

not promises.

Before most of the industry has even made available their first generation of client/server tools, we'd like to introduce you to our next generation of **FOUNDATION®** for Cooperative Processing (FCP).

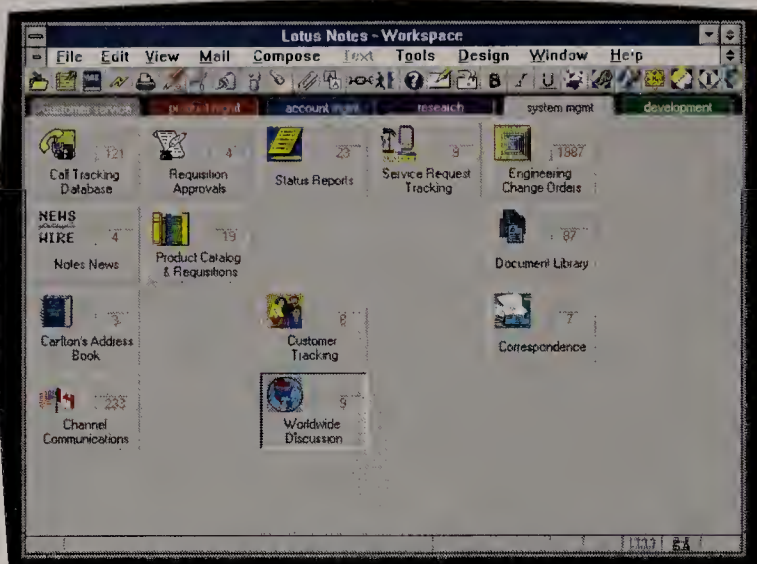
With this next generation tool you can take advantage of the experience of **FOUNDATION** customers who have successfully implemented client/server applications over the past two years. From these experiences, FCP has been enhanced to make client/server systems development easier and faster for your departmental and enterprise-wide needs.

Whether you are looking for a system for 50 or 500 users, FCP will help you deliver. The new Rapid Application Builder dramatically simplifies

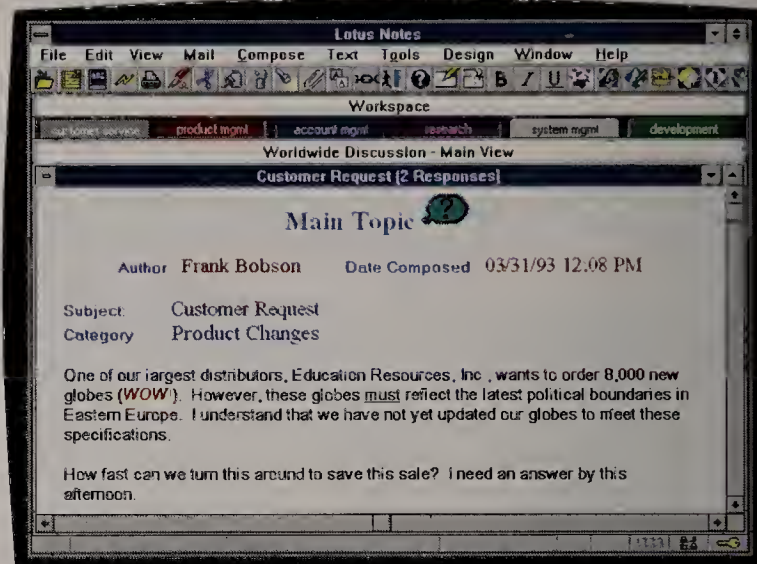
development, providing you the ease and speed of the current GUI tools. However, where other GUI tools stop, FCP keeps going. FCP provides the foundation you need to build a complete client/server system robust enough to meet your changing needs.

To learn how **FOUNDATION** for Cooperative Processing can make your move to client/server easier, just give us a call at 1-800-458-8851. Outside the U.S. and Canada, call 1-312-507-5161. And enter the next generation of client/server computing.

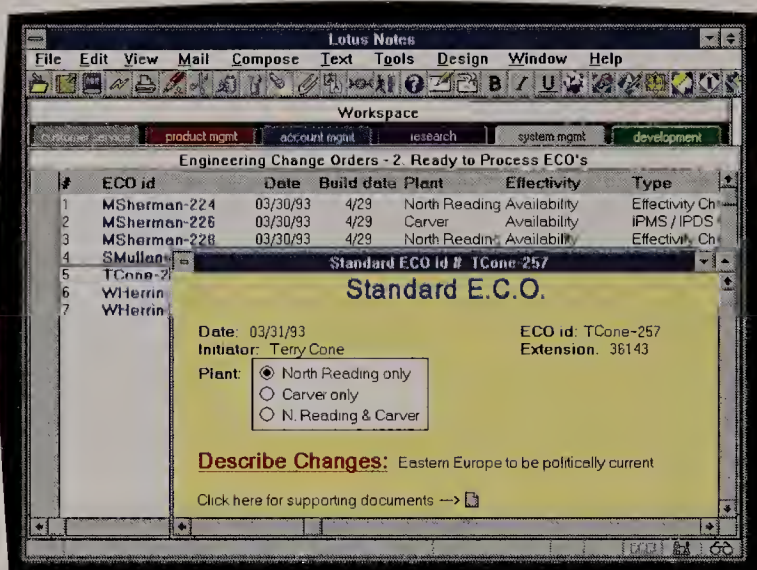
ANDERSEN
CONSULTING
Software Products



1. This is James' Notes desktop. He uses it to access information and work quickly with people in all departments to solve problems worldwide. James clicks on the Worldwide Discussion application to catch up with important company news. The SmartIcons across the top make it even easier to work in Notes.



2. The field rep in Texas is working on a request from a customer. But to make the sale the product, in this case a globe, has to be changed to reflect the most up-to-date countries and borders. And evidently time is critical. The competition must already be in there pitching.



5. Once he has the information, he clicks on the Engineering Change Order application to request specific product changes from the plant in North Reading. He links the supporting Newswire information to the ECO. It will be easily viewed with a single click of a button.

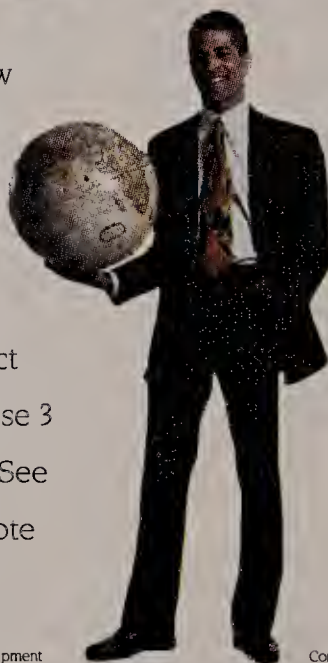


6. After lunch he opens a document from Ellen in product development who has responded with the necessary changes and scheduling information. The new art was scanned directly through Lotus Notes: Document Imaging from the art department. James approves the art for manufacturing.

HOW LOTUS NOTES RELEA

Thousands of companies already know how Lotus Notes® helps them respond more quickly and effectively to the demands of everyday business. Now Release 3 extends that power to new dimensions.

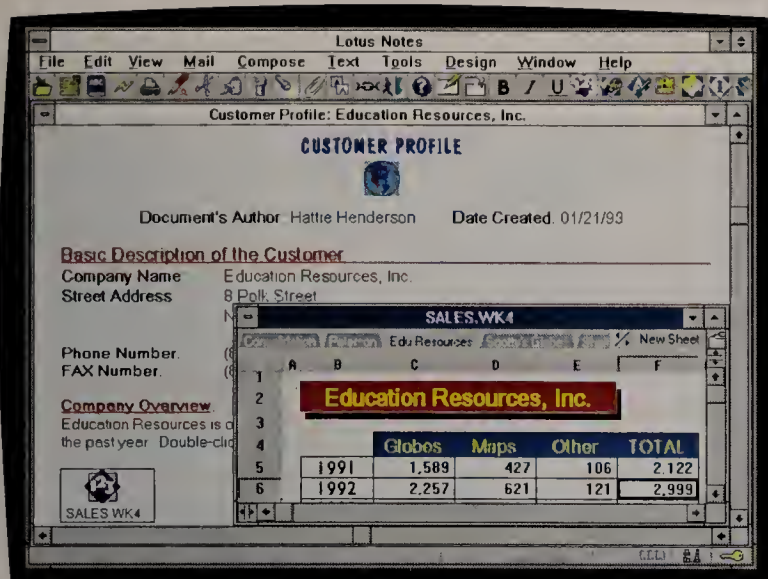
Just watch how James Carlton, a new district manager at Global Publishing, uses Notes Release 3 to solve a major global problem in short order. See how he uses information from on-site and remote locations. From both inside the company and



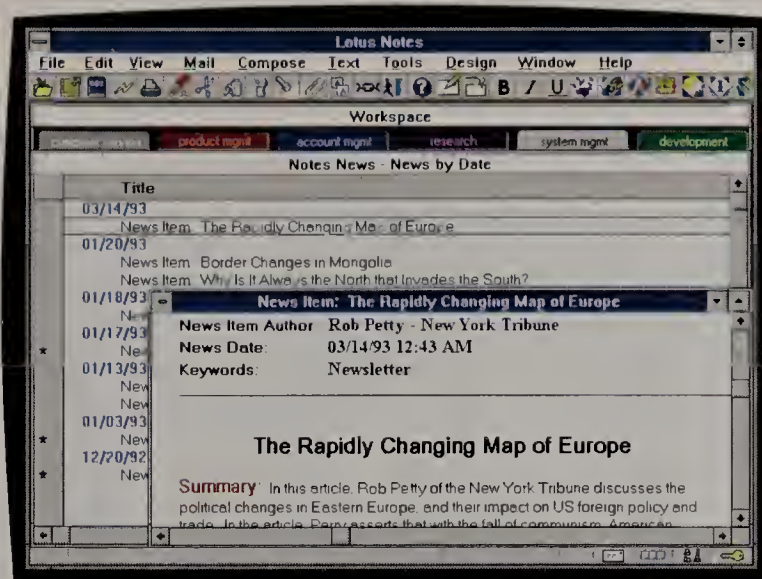
external sources. Across a variety of platforms. How he uses applications such as Account Tracking, Newswire, and Engineering Change Orders to get a new product developed fast. And how he creates an informal team spanning a range of departments to do it.

With the new Release 3, Lotus Notes now supports all the leading GUI platforms: Windows™ OS/2® UNIX,* even Macintosh®.

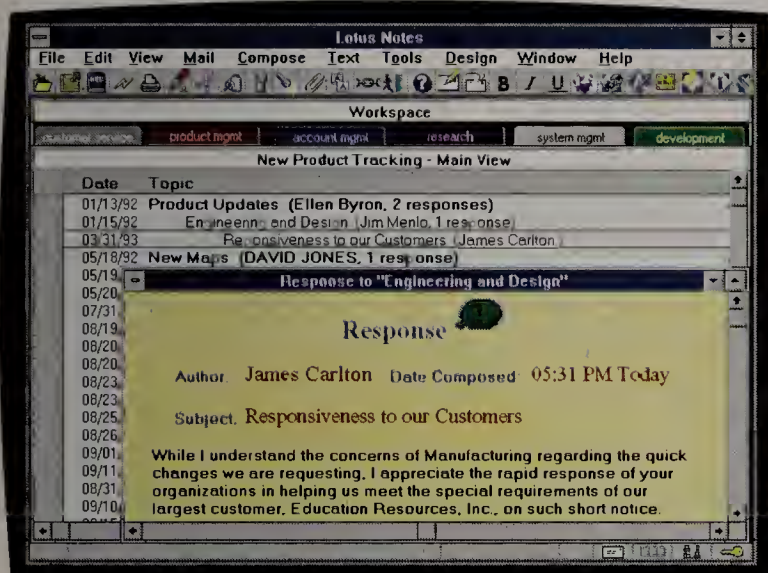
Which means the award-winning workgroup power of Lotus Notes is now readily available to help



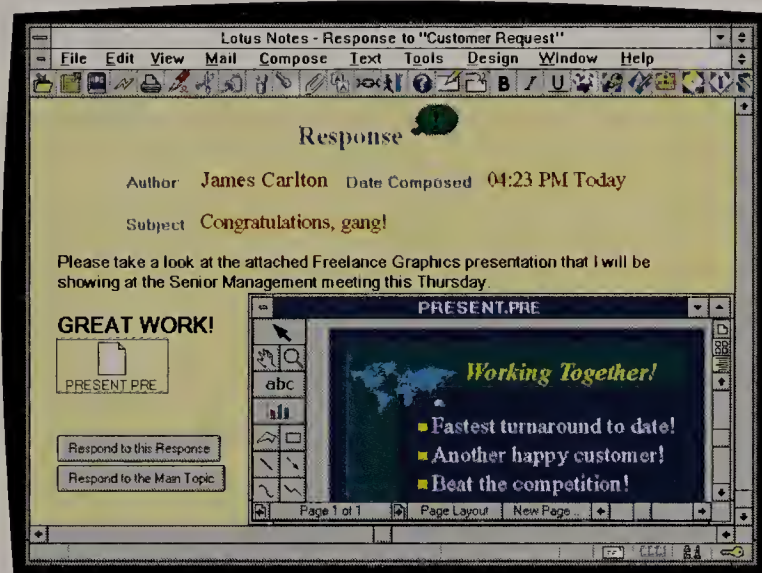
3. He clicks on the Customer Tracking application to learn more about this customer. The profile includes an attached 1-2-3* spreadsheet. He double clicks the icon to open the spreadsheet and finds that Education Resources is a very large customer that pays its bills.



4. James' next step is to click on the Newswire database for the most up-to-date report on precisely what geographical changes will have to be made on the new globe. And just how extensive they'll be.



7. On the Product Tracking application, all departments involved have confirmed that they can meet the schedule. However, they've cautioned James to be careful about rushing schedules in the future. James uses the Discussion database to acknowledge their comments and thank them for their efforts.



8. Wanting to record and promote the team's accomplishments, James puts together a presentation for senior management in Freelance Graphics. Then he posts the presentation in the Presentation database so everyone can see how the team rearranged the world to save a big account.

SE 3 CHANGED THE WORLD.

virtually all networked businesses improve their performance. By accelerating business processes and helping people work together more effectively than ever before.

You'll find your favorite user-friendly features from other Lotus® applications like SmartIcons™ and a status bar make Notes even easier to use.

Release 3 also features enhanced templates that are very easy to customize so you can build new applications faster and more efficiently.

But you don't have to change your world to get going on

Notes. Now you can get everything you need in the Lotus Notes Starter Pack for just \$995 (SRP). It includes one Notes Server for Windows and two Notes Clients for Windows. Plus more than 25 ready-to-use applications for business processes like account management, customer service and product development. For a free demo disk call **1-800-828-7086, ext. 8899** or visit your Lotus Authorized Reseller or Lotus Business Partner.

Lotus Notes

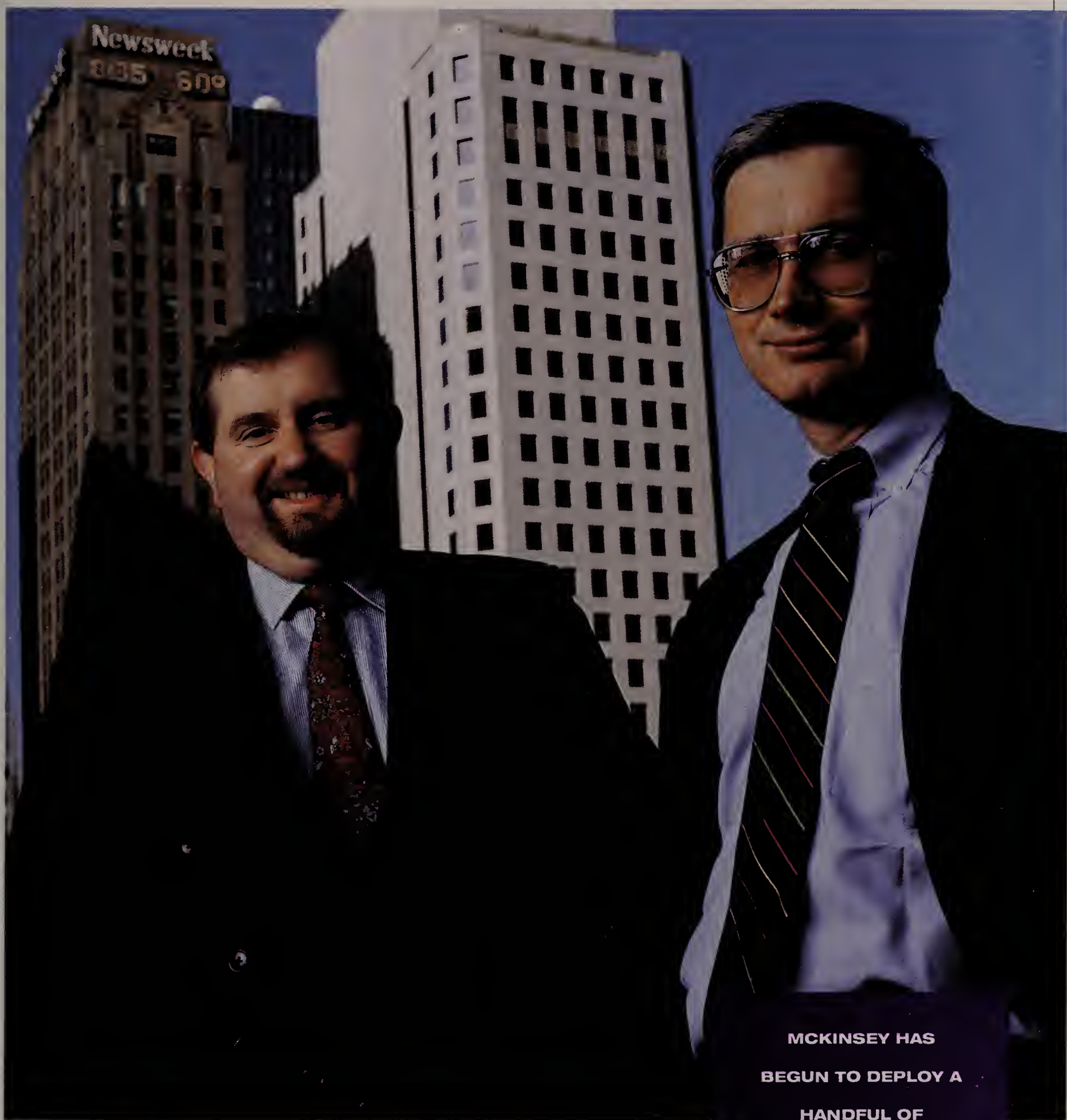
WORKGROUP APPLICATION SOFTWARE FOR WINDOWS

LEARNING *to* SHARE

What should the goal of workgroup computing be: enhanced communication or true collaboration? Two big-name consultants with distinct cultures implemented the same workgroup tool and produced very different answers.

BY THOMAS KIELY

To judge from the experiences of Price Waterhouse and McKinsey & Co. Inc., two New York-based professional-services firms, the real-world use of workgroup computing may yet confound the expectations of skeptics and visionaries alike. Curmudgeons who view technologies intended to enhance the productivity of group work as just another loopy idea from Egghead University will be surprised at how quickly end users are learning to love—and exploit—these tools. On the other hand, groupware enthusiasts may be discouraged by self-interested end users who are subverting the collaborative nature of the technology—with great success.



HANS-DIETER BLUHM (left) and **BROOK MANVILLE**: *The slow implementation of Notes has been a boon, allowing for better deployment, training and support.*

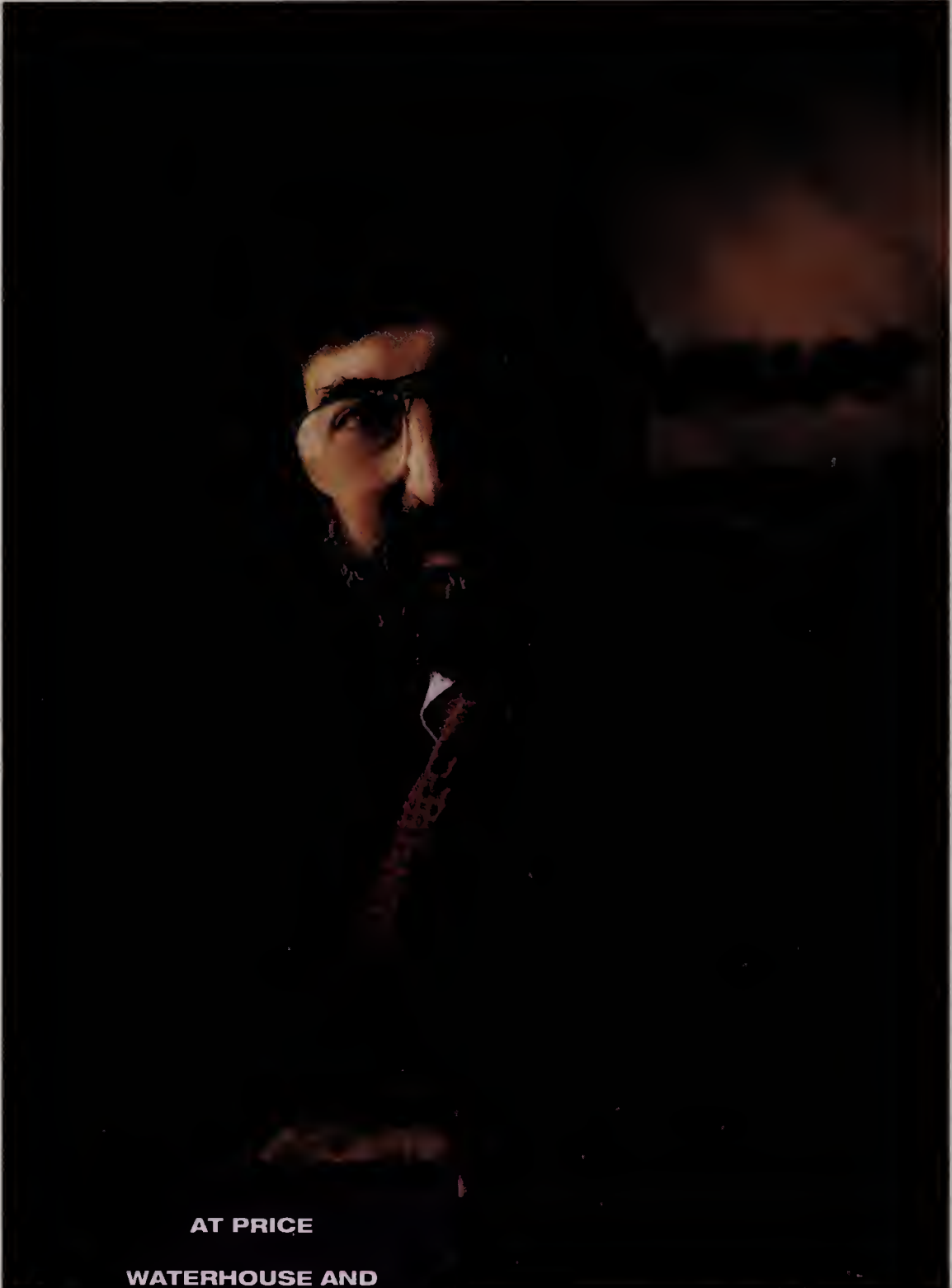
The hubbub surrounding groupware arises from the premise that no employee is an island. In the emerging reengineered world of work, interactions among employees have become increasingly complex. Teams—ideally cross-functional teams—are flourishing within organizations, enabling employees to complete high-

er-quality work with greater speed and flexibility. Teams need tools: Voila—workgroup technologies.

The workgroup technology of choice at both McKinsey and Price Waterhouse is Notes, from Lotus Development Corp. in Cambridge, Mass. Notes is not the only workgroup product available. Applications now clam-

**MCKINSEY HAS
BEGUN TO DEPLOY A
HANDFUL OF
CRITICAL
COLLABORATIVE
NOTES
APPLICATIONS.**

PHOTO BY KENT HANSON



**AT PRICE
WATERHOUSE AND
NEARLY A DOZEN
OTHER LARGE
ORGANIZATIONS
EXPERIMENTING
WITH NOTES,
ELECTRONIC GROUP
WORK, IF DONE AT
ALL, IS A SIDE
BENEFIT OF THE
TECHNOLOGY.**

SHELDON LAUBE: *Employees use Notes in ways that provide value to their work, here and now.*

oring for attention in the marketplace for team-support systems include group-calendar software, document-sharing systems, workflow applications, team-brainstorming technologies and E-mail add-ons, such as software to facilitate networked vacation planning or travel authorization. But both firms chose Notes because it is a broad-based, client/server technology that links employees across the enterprise and facilitates the sharing of information.

McKinsey's team-oriented culture would seem to be a more hospitable terrain for Notes than the traditional,

individualistic environment at Price Waterhouse. While it is too early to assess the net effect of Notes in either organization, it appears as though Notes *will* buttress collaborative work at McKinsey.

But McKinsey is an anomaly: Rare is the organization that places so much business emphasis on group work. At Price Waterhouse—and nearly a dozen other large organizations experimenting with Notes—the primary benefit of the technology to end users is easy communications and the quick and effective access it provides to shared organizational pools of knowledge. Electronic group work, if done at all, is a side benefit of the technology.

There are other differences. Price Waterhouse is a bullish user of Notes; McKinsey has taken a more measured approach. Whereas Price Waterhouse rolled out Notes in a top-down, gung-ho implementation, McKinsey has been nurturing bottom-up acceptance of the technology. While these factors may have influenced the acceptance and use of workgroup computing in the two cultures, one fact remains: Workgroup computing can be a big hit in traditional organizations in spite of its new-age premise. Collaboration, it seems, wears many faces.

PRICE WATERHOUSE WAS AMONG the earliest customers for Notes—and remains the largest user of the technology, having purchased 35,000 Notes licenses to date. Sheldon Laube, national director of information and technology at the \$3.8 billion firm, discovered Notes early in 1989, months before Lotus released the product. He has been an evangelist for Notes ever since.

At the time, Laube was searching for a technology that would capture, organize and disseminate information throughout the firm. (Price Waterhouse and McKinsey are in the knowledge business. Both offer management-consulting practices; Price Waterhouse also provides accounting and business-advisory services.) Laube had bulletin boards in mind,

but when he came across Notes, he tested it himself for a week, then sold its value to top management.

The rollout of Notes went fast—too fast, according to a study of the implementation in one Price Waterhouse office. The author of the study, Wanda Orlikowski, assistant professor of information technologies at MIT in Cambridge, Mass., asserts that employees caught up in the im-

required to learn or use Notes. These consultants live and breathe billable hours: To whom would they bill their Notes time? What's more, was it worth their time to enter information into the system—for someone else's benefit—on the gamble that somewhere down the road, information would appear in Notes that was useful to them? To counteract this reluctance, Price Waterhouse

a joint project."

Laube thinks Orlikowski has an ivory-tower view of the issue. "The MIT people have one model for Notes, and they would have you believe that it's the only model," Laube said. In contrast to Orlikowski's group-inspired vision for Notes, Laube offers an alternative: Employees use Notes at Price Waterhouse in ways that provide value to their work, here and now.

First of all, he said, don't underestimate the popularity of Notes. More than 17,000 Price Waterhouse employees now use the system, and the rollout continues at a rapid pace. The company is even beginning to link up to clients who are Notes users. Secondly, as employees become acquainted with the system, their interests may shift or become more complex. (Auditing Partner Todd believes that Notes may eventually foster cultural changes within the firm.) But in any case, daily business needs drive the use of Notes, not technological visions. Price Waterhouse senior executives are sold on the technology—to date the firm has spent about \$20 million on Notes, including necessary network upgrades.

Others in the firm echo Laube's observation that Notes is a business tool, not a Trojan horse for new theoretical models of work. "We do have some discussion databases, some collaborative databases, but they haven't taken hold," said Keith Wishon, Price Waterhouse managing partner for western region financial services. Wishon uses Notes daily for communications—he doesn't know how the company got along without it—but said he can't envision how it could provide value to group work within the firm. "Notes isn't online, real time," he said. "It's a shared-database approach [with delays between updates]. If five people are working on a project, it's easier just to get together."

A number of other companies experimenting with Notes seem to be going in the same direction as Price Waterhouse. IS executives in companies as diverse as Texaco Inc.,

"Some people hold their knowledge close to their vest. Notes doesn't force people to share."

—Tony Todd

plementation whirlwind had little opportunity to comprehend the possibilities of the new technology. (Orlikowski refuses to divulge the identity of her subject firm, but Price Waterhouse directors readily admit that it was their company.)

In her MIT-published report, "Learning from Notes: Organizational Issues in Groupware Implementation," Orlikowski concluded that the rapid pace of the implementation—which was driven by breathless user demand—led users to mistakenly view Notes as simply a new and better communications tool rather than as a "transforming technology" capable of supporting fundamentally redesigned work processes. Additionally, the firm's individualistic culture undercut the technology's real potential, which is to support collaborative work.

For instance, consultants in the firm who hoard, rather than share, information resist Notes, or use it chiefly for their own advantage. Knowledge is power in any company, but in a knowledge company it is the stuff of career tracks, observed Tony Todd, an auditing partner in the firm's San Francisco office. "Some people hold their knowledge close to their vest," he said. "Notes doesn't force people to share."

Others initially balked at the time

technologists seeded the system centrally with useful, relevant information such as databases on hot business topics and resumes. Senior managers also helped. The company chairman used Notes, and if he sent a message over the system, woe to the employee who missed it.

Orlikowski charged that the culture of the firm, and the way the implementation was handled, has influenced employees to use Notes only in its palest form. When Price Waterhouse partners explain the benefits of Notes, they invariably describe the technology's communications power. Using Notes, a consultant in Pittsburgh can send a document to colleagues in Hartford and New York, gather comments and corrections, then print and deliver the document to a client that same day. Or again: A banking consultant in Washington, picking up regulatory gossip and sensing an opportunity, broadcasts a message to the 200 or more Price Waterhouse banking consultants throughout the nation, who immediately broach the suggestion with their clients.

"That's [faxing documents or sending] E-mail," said Orlikowski. "Notes, used in this way, is important to [Price Waterhouse], and to their business, but it isn't the same thing as collaboratively working together on

Monsanto Co., MCI Communications Corp. and Dell Computer Corp. are collecting and managing information in Notes databases. Each company has developed applications that link workers to the knowledge in these databases—quality records, audited figures, library catalogs, customer information—but fostering the shared-workgroup vision that lies behind Notes has proved elusive.

“Notes is a great vehicle for transforming individual knowledge into institutional knowledge,” said John Single, national information technology practice leader at Price Waterhouse. As for tag-team computing, well....

IN CONTRAST TO PRICE WATERHOUSE, McKinsey has danced with Notes in a one-two step that Orlikowski might have set to music. The firm is implementing Notes slowly, and IS managers are diligently promoting the technology's benefits as a tool for collaborative work. The firm's culture emphasizes knowledge sharing and teamwork. Yet, with some critical exceptions, the Notes applications budding in McKinsey's garden look similar to Laube's.

In a sense, Notes is meeting dissimilar business needs in the two firms. Teams of Price Waterhouse consultants work with clients, often on-site, and need to communicate among each other and with the home office—Notes is the tool for that. But at McKinsey, collaboration is built into the structure of the firm itself.

As Tom Peters describes it in his latest book, *Liberation Management*, McKinsey is a fluid organization (internal motion flows around projects) with a strong culture for knowledge, teamwork and client service. Geographically distributed offices are the profit-and-loss units of the firm, but two sets of teams—practice and client-service—form its work structure.

“Practice teams are the backbone of knowledge gathering and sharing at McKinsey,” said Brook Manville, co-director of information and technology (along with Hans-Dieter Bluhm, in Dusseldorf, Germany). Practices are built around industry specialties, such as health care and

utilities, and functional specialties, such as marketing, finance and organizational performance. The teams collect, manage and dispense the firm's aggregate knowledge of their respective specialties.

Client teams are cross-office, cross-functional, ad hoc groups that service clients and must interact regularly with practice teams. Good communications and ready access to information—either already assembled or in the process of being gathered—are essential for both types of teams and for the firm as a whole.

McKinsey has been experimenting with Notes for two years, and Manville says it shows promise for meeting the firm's knowledge business needs. To date, McKinsey has implemented about 200 applications in Notes; about 800 employees use

seey is also a closely held company and will not disclose revenues or the cost, to date, of the Notes implementation. Nevertheless, McKinsey is discovering many similarities with its larger competitor as it rolls out workgroup computing.

For instance, the E-mail component of Notes has quickly become popular among many users, according to Manville. “It is the loss leader,” he said. “Many people tend to use it first. Then they begin to see other things they can do with Notes.” Other employees leapt directly into Notes applications and use E-mail infrequently. The most popular firmwide Notes application is a database of internal documents—a knowledge reservoir, similar to collected information pools at Price Waterhouse. What's more, employees have seized

“Distributed teams are a business objective at McKinsey. The technology makes it easier for us to work in distributed teams.”

—Leslie Giordano

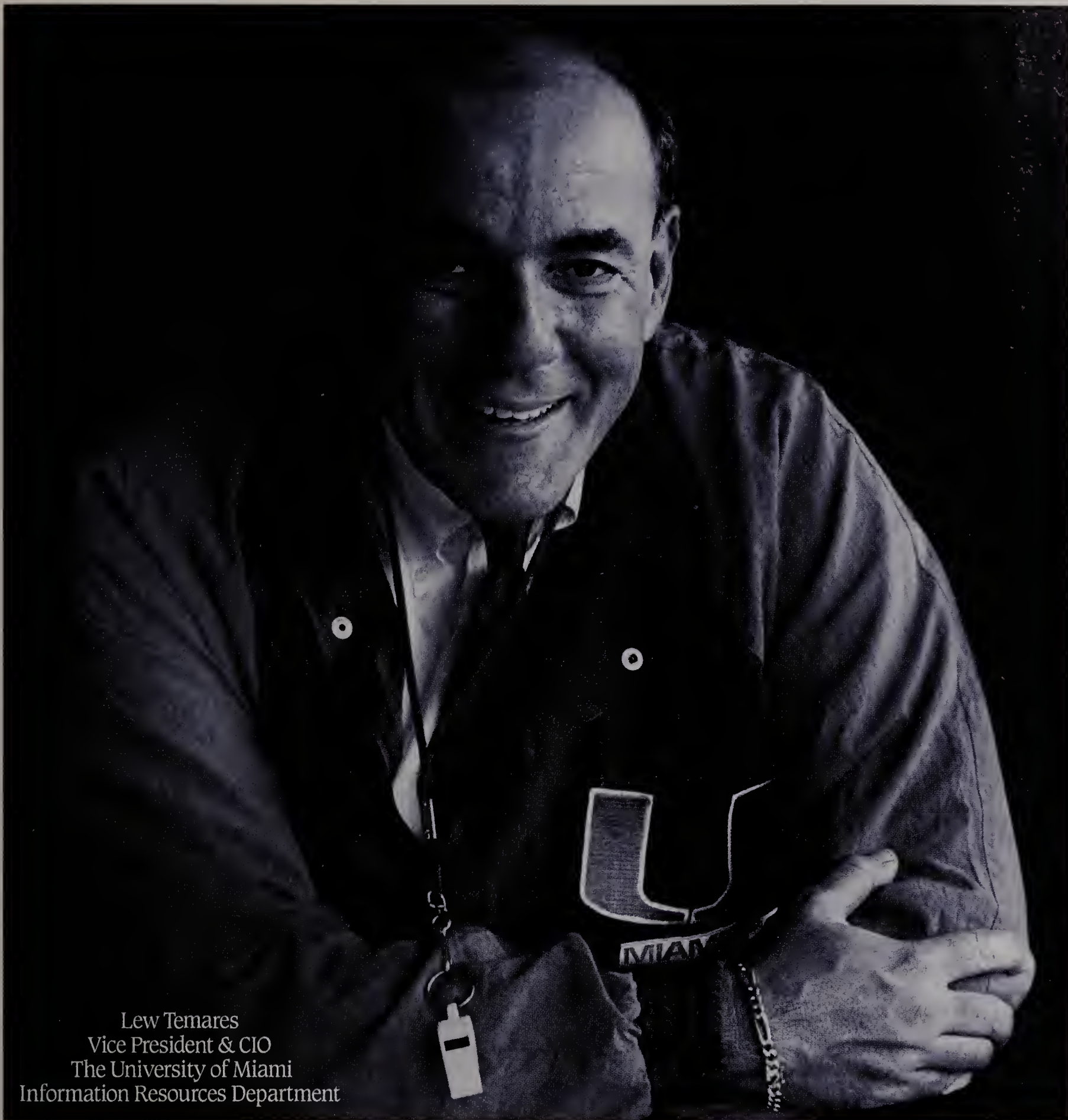
the system. (In contrast, Price Waterhouse has about 1,000 Notes databases up and running.)

Why the slow growth? McKinsey has a large base of Macintosh computers, and all but the latest version of Notes, released in April, would run only on IBM-compatible PCs. McKinsey's network also needs to be upgraded to handle the expected Notes traffic—an expensive commitment for an unproven technology. IS staff at McKinsey view these impediments as a boon, not a drawback. They want a slow implementation, so they can better manage deployment, training and support for the technology. They also want to study closely what works in the new environment and what doesn't.

McKinsey is smaller than Price Waterhouse—about 5,000 employees worldwide, compared with the 48,000 employees at Laube's firm. McKin-

upon Notes to build such applications as conference-room schedule calendars and to aid in the production of local reports—what McKinsey IS staffers refer to as “back-office support” applications.

But unlike Price Waterhouse, McKinsey has begun to deploy a handful of critical collaborative Notes applications. The firm's European financial industry group created a database of economic and financial information about Old World financial-service organizations, noted co-director Bluhm. “Basically, it's a distributed database of a loose collection of different types of information,” he said. Bluhm added that all of McKinsey's European offices are tied into the database, sparking some collaborative work. McKinsey's New York office has access to the European database too, and the firm is thinking of expanding the scope and



Lew Temares
Vice President & CIO
The University of Miami
Information Resources Department

"Product quality. Technical excellence. Industrial-strength applications. Three simple reasons why Computer Associates has been my most important software vendor for more than 10 years."



CA's Computing
Architecture
For The 90s.

Service and support. Financial stability. They all matter a lot. But ultimately, what matters the most is the quality of the software itself.

Which is why 95% of the Fortune 500 choose CA software. We invest more in R&D every week — \$4 million — than the average software company earns in a year. And it shows. In a world filled with software crashes, CA software is a shining example of reliability. They call it mission-critical software. And we agree.

To us, every mission is.

**COMPUTER
ASSOCIATES**
Software superior by design.



WANDA ORLIKOWSKI: *Notes can be a "transforming technology" capable of supporting fundamentally redesigned work processes.*

breadth of the application, as well as pushing its wider distribution in North American offices.

More importantly, practice and client-service teams are beginning to share information through Notes, said Leslie Giordano, a project manager for the technology. To maintain client confidentiality, the practice teams must sometimes "sanitize" the information dispersed to various client-service teams, but the ebb and flow of knowledge is promising. "Distributed teams are [a business objective] at McKinsey," said Giordano. "The technology makes it easier for us to work in distributed teams."

**ORLIKOWSKI
CHARGED THAT THE
CULTURE OF THE
FIRM, AND THE WAY
THE
IMPLEMENTATION
WAS HANDLED, HAS
INFLUENCED
EMPLOYEES TO USE
NOTES ONLY IN ITS
PALEST FORM.**

Other companies have begun to explore the group-work face of Notes as well. Chase Manhattan Bank used the technology to build a global client-tracking system that coordinates the geographically dispersed encounters between bank employees and customers. Dell Computer built databases to track problems and business issues. And, while the bulk of Texaco's Notes usage remains in the Price Waterhouse tradition, it is building more-collaborative applications—notably, for the coordination of a major engineering project in Russia.

In each case, the technology met a business need—the market-driven necessity to share information. Orlikowski's observation—that mindsets and culture influence the use of technology—has validity, but Laube's point has more clout: Business needs, not business models, overshadow all. Technology tools must make business sense, or they make no sense at all.

It is too early to tell whether Notes will thrive or perish at any of these firms—or whether the technology will spark cultural revolution at Price Waterhouse, or counterrevolution at McKinsey. As Michael Hammer and James Champy point out in their book, *Reengineering the Corporation*, new technologies create previously undreamed-of applications. Edison thought the phonograph would be valuable primarily for recording last wishes; instead it ushered in the multibillion-dollar recording industry. Marconi believed radio would operate point-to-point; he never envisioned a legion of disc jockeys broadcasting music and bad jokes around the world. If workgroup computing is to survive the decade, perhaps it, too, must spark the creation of new applications, yet unimagined at McKinsey or Price Waterhouse. ☐

Free Seminar

For information about a free seminar on **Application Development for Cross Platform Execution**, or for information on any of Synon's Cross-Platform Development Tools, fill-in and return the attached postage paid card, or fax the information to 415-461-4239.

Free half-day seminar held in convenient locations in:

Atlanta	June 29	Montreal	July 20
Boston	July 6	Omaha	July 27
Cincinnati	July 20	Phoenix	July 29
Cleveland	July 7	Pittsburgh	July 15
Indianapolis	July 22	Portland	July 1
Las Vegas	July 21	San Jose	July 20
Louisville	July 29	Seattle	July 13
Minneapolis	June 30	Toronto	July 21

Yes, I'm interested.

- ☐ Please send me information on your **Application Development for Cross Platform Execution** Seminar in the following city: _____
- ☐ Please send me information on Synon's Cross-Platform Development Tools.
- ☐ Please have a sales person contact me.

Name _____

Title _____

Company _____

Address _____

City/State/Zip _____

Telephone _____ Fax _____

Platform(s) installed at this site: _____

Free Seminar

See other side for details.

SYNON



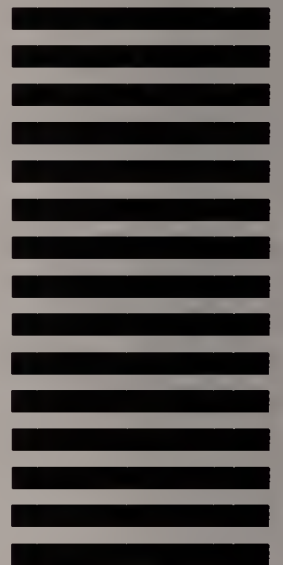
NO POSTAGE
NECESSARY
IF MAILED
IN THE U.S.

BUSINESS REPLY MAIL

FIRST CLASS MAIL PERMIT NO. 55 CORTE MADERA, CA

POSTAGE WILL BE PAID BY ADDRESSEE

SYNON, INC.
1100 LARKSPUR LANDING CIRCLE
LARKSPUR, CA 94939-1806



THE HIGH STAKES APPLICATION DEVELOPMENT GAME



THE HIGH STAKES APPLICATION DEVELOPMENT GAME



Go ahead, pick one. Any one. Now pick again.

With Synon, you win the high stakes game of software development no matter how the cards fall. You can develop sophisticated, industrial strength applications to run on AS/400[™], RS/6000, HP, Mainframes, Client/Server and much more.

Because Synon is implementation independent, when the deck gets reshuffled, you can regenerate your application code for your platform of choice. So as new platforms become available, existing Synon-developed applications will be transferable.

You are never caught holding the wrong cards. You save time, you save money, and you increase application quality with the added benefit of platform independence.

Plus, you can make better use of what you've already been dealt because Synon provides CASE Enabling for Legacy Systems. Your past investment can continue to work hard for you in the future.

Whether you are trying to build a new application, installing a CASE-Enabled Application from one of our Development Alliance

Partners, or rightsizing off a mainframe, Synon stacks the deck so you can't lose.

You retain the power of choice.

For more information about Synon, or for information about a free seminar on Application Development for Cross-Platform Execution in a city near you, call 1-800-677-9666.

SYNON

Cross-Platform Application
Development

AS/400 is a trademark of International Business Machines Corp. UNIX is a registered trademark of UNIX Systems Laboratories, Inc. All other product names are trademarks or registered trademarks of their respective holders.

Bill Davidow says the corporation of the future will be highly responsive and tightly linked with its core suppliers and customers. IT will provide the infrastructure, but first companies must undergo cultural change. BY RICHARD PASTORE

A VIRTUAL VISIONARY

"Hello, Virtual Widgets? I want 400 delivered tomorrow, and I want them in green. No, make that blue, with three openings on the left side, two inches between each. Never mind, I'll just enter the specs myself on your EDI order screen."

WITNESS THE BIRTH of another "virtual product," instantaneously produced and delivered to the customer's specifications. The manufacturer, a virtual corporation, has reorganized itself around rapid response to customer demand, forging tight relational and technological bonds with core suppliers and long-term customers.

That's the shape of the corporation of the future, in the view of Bill Davidow, business futurist and ven-

ture capitalist with the Silicon Valley firm Mohr, Davidow Ventures. There's a lot at stake, Davidow writes in his latest book, *The Virtual Corporation*, co-authored with Michael Malone. By the year 2015, he and Malone predict, the United States will either be a leader in this "virtual" business revolution or degenerate into a postindustrial version of a developing country.

Today's companies must replace

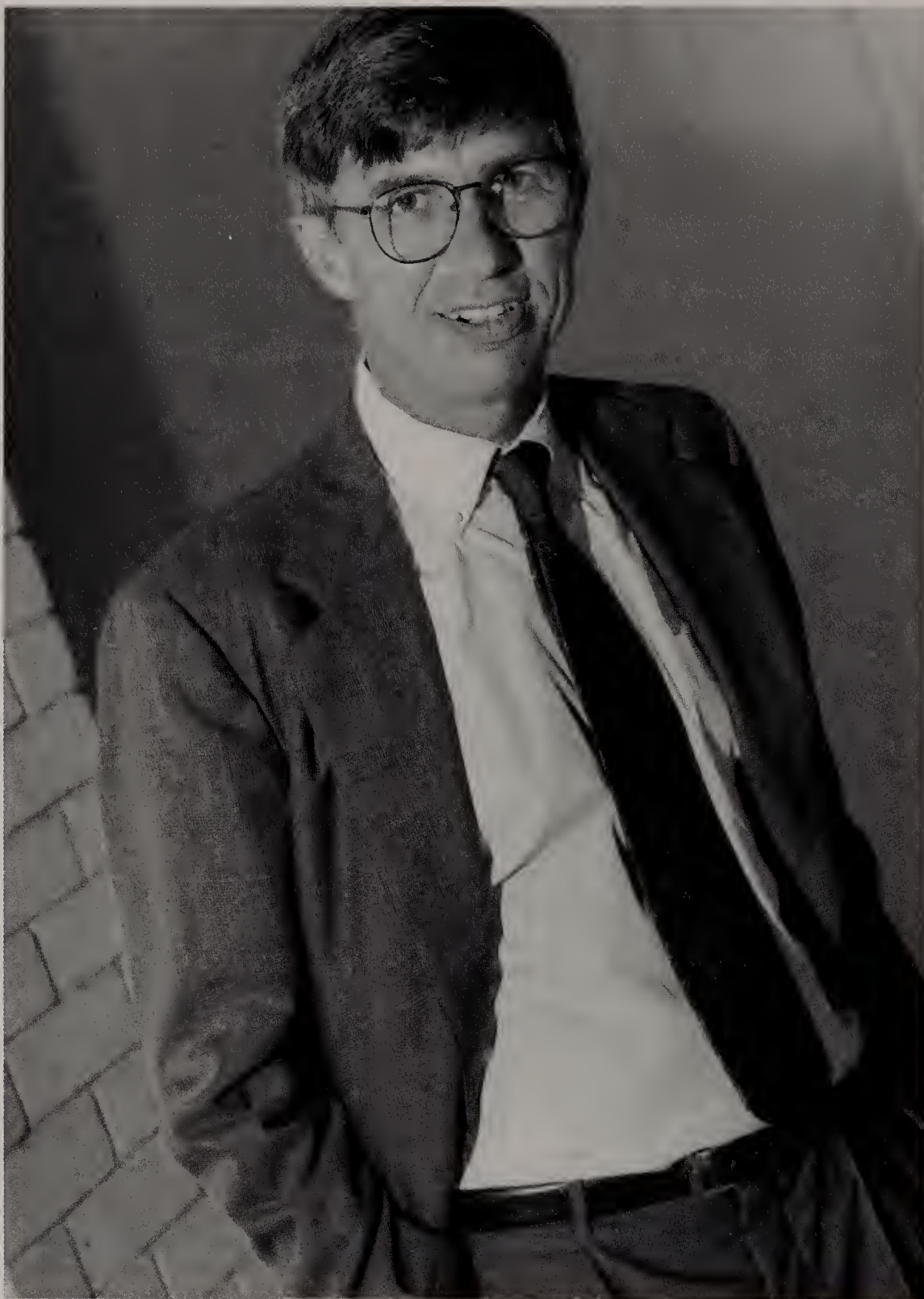


their high walls and arms-length business relationships with more permeable interfaces between themselves and their suppliers and customers. These trading partners will have to share technology, equipment, designs and even trade secrets to make the virtual product a reality. Indeed, the virtual corporation will employ its customers as co-producers in everything it builds, and the corporation will find itself being increasingly managed by its best customers.

Davidow, a former executive with

Intel Corp. and Hewlett-Packard Co., sees IS as key to this corporate makeover. Thanks to innovations in information processing and manufacturing systems, products and services can be made available cost-effectively to customers at any time, in any place and in any variation—hence the term virtual. To keep up with customers' changing needs, IS must maintain integrated data files on customers, products, and design and production methodologies. Besides providing the electronic conduits for intercompany communication, IS must also expand

BILL DAVIDOW: "As information grows as the basis for making decisions, the CIO role will be more important than ever."



its reach to deliver data to more decision-makers.

As a follow-up to his intriguing presentation at the CIO Perspectives Conference last March, Davidow spoke about IS and the virtual corporation from his office in Menlo Park, Calif., with *CIO* Senior Writer Richard Pastore.

CIO: *What's behind the push toward virtual products and corporations?*

DAVIDOW: The push is coming from both corporations and customers. Being responsive to customers has always been a big competitive advantage. The customers themselves have been ready for this for years. As it begins to cost less and less to

get customized products delivered quickly, more people will have an instantaneous-demand mentality.

CIO: *Isn't that happening already?*

DAVIDOW: Yes it is. Since the coming of the 10-minute oil change, are people willing anymore to leave their cars all day for that service? It's the same with one-hour photo developing. And look at the travel agencies that allow you to go online with their systems and make your own travel reservations.

CIO: *What steps are organizations already taking that will carry them closer to virtuality?*

DAVIDOW: Some companies are

already there, like Actel, which makes field-programmable gate arrays, and companies like LensCrafters and Pearle Vision Express, which brought the eyeglass lab to the customer site. Other companies are proceeding along this curve by shortening cycle and product-development times.

I see an increasing number of corporations trying to tailor output to the customers' needs. I also see a move away from companies continually trying to acquire new customers

"Groupware systems facilitate concurrent engineering, and they draw customer-service and marketing people into the project from day one."

and letting their old customer bases erode. They're realizing that much of their growth will come from sustaining relationships with good customers. You see that now with banks and credit-card companies.

CIO: *What about the temporary, ad hoc partnerships forming more frequently between companies of late? Isn't this a forerunner of the virtual corporation?*

DAVIDOW: Sporadic partnering is going to happen, and it will be effective in some situations (such as the temporary relationship between Apple Computer and Sony that produced the Powerbook portable computer). But in the virtual paradigm, customers and suppliers will be looking for long-term relationships with stable partners. Temporary marriages just don't provide that stability.

CIO: *OK, what else are we doing wrong?*

DAVIDOW: Much of the restructuring that's going on is happening without a vision of where the corporation's going. To cut costs, we're getting rid of middle managers who

had been directing the workers. If workers aren't subsequently trained to take on that responsibility, things won't work very well.

CIO: *What will happen to the workers and executives who survive the transformation to the virtual corporation?*

DAVIDOW: Employees will have greater responsibility down the line, and they will come together in cross-functional teams to resolve customer problems. A lot more of the decisions will be made by these teams rather than by functional officers.

It's been said that in U.S. companies, operational direction comes from the top of the organization and strategy comes from the bottom. In Japan, it's just the opposite. I think executives must move toward providing more of the strategic vision and relationship management while delegating operational responsibilities down the line to employees who have direct contact with customers. If anything, trends in technology and society will shift more quickly in the future, allowing management even less time to predict and respond to demographic changes in the market.

CIO: *Speaking of technology, what is information systems' role in the virtual transformation?*

DAVIDOW: Information technology provides the infrastructure for the corporation to communicate with customers and deliver information necessary for decision-making and trend-forecasting. But before IT can do its job, the organization must make the cultural changes that bring greater responsiveness [to customer needs]. If management insists on maintaining a strictly functional organization and does not empower workers to make decisions, IS will add little value. IS can provide tools that will empower employees, but management has to decide they want them empowered.

CIO: *What specific technologies, besides obvious ones like networking and EDI, will con-*

tribute most to the virtual transformation?

DAVIDOW: First of all, the technology is way ahead of the organizations. There are already some companies using today's technology that are a lot further along in responsiveness to customers. So we don't have to sit around and wait for the technology to catch up.

Groupware systems are very powerful systems that will facilitate design of virtual products. They facilitate concurrent engineering, and they draw customer-service and marketing people into the project from day one. Employees from multiple disciplines will be able to develop products as peers, with the power to make decisions without seeking approval for everything up the line.

CIO: *What of the CIO in the virtual corporation?*

DAVIDOW: As information grows as the basis for making decisions, the CIO role will be more important than ever. [IS] will provide the tools that drive the new processes. It's up to the CIO to point out that processes and structures must change

before the tools can be applied. In the past, IS was often used in a way that ossified the existing bureaucracy.

CIO: *You've written that managers will become more accountable to suppliers and customers as well as to their own organizations. Are CIOs ready for this wider accountability?*

DAVIDOW: No. CIOs have to constantly expand their horizons and realize the company is becoming intermeshed with its customers and suppliers. They need to learn how to reach out to these partners and get them involved. The CIOs will need a broader set of skills to understand the virtual business environment. And they'll need to focus more on the virtual processes the systems support and less on the details of the systems themselves.

CIO: *What are the inherent risks, and how can IS help minimize them?*

DAVIDOW: The virtual corporation will have tighter links to a smaller pool of suppliers and customers. Naturally, the narrower your customer base is, the more linked you become to their success or failure. In Japan, many suppliers only supply one or two companies. If one goes away, you're effectively out of business.

Many would-be virtual corporations will likely start with unrealistic expectations of how quickly they can get there. They go for the rapid transformation instead of incremental change and find they aren't strong enough to pull it off. They need to chip away at the problem, get their quality act together and initiate more intensive employee training.

IS managers must be aware of the technological trends and tell their bosses, their suppliers and their customers about the capabilities IS can put at their disposal. More importantly, IS managers can help by pushing against the status quo to get companies to do the right thing. If they accept the status quo and automate yesterday's processes, people will later look back and ask why they don't have good information systems. In the virtual corporation, the IS manager will be in the hot seat like never before. ☐



RATING THE *new* WORLD ORDER

BY MEGHAN O'LEARY AND LEW MCCREARY

The old saw cautions us always to be careful what we wish for, since it might come true and turn out to be a great big disappointment. Now that the long-cherished wish of end users to control their IT destinies comes true with growing frequency, do any of them wish they'd never asked? Not exactly. "Certainly there are some trade-offs," said Donald L. Glass, senior vice president of build-

ing products manufacturing/sales at Atlanta-based Georgia-Pacific. "I think that as you move all the way to decentralization...you get more control locally but lose synergy. On the other hand, central [IS] can rarely understand users' needs."

By whatever means it is accomplished—whether through true, partial or virtual IS decentralization—the dispersion of IS resources and decision-making authority into end-user departments and divisions is now an established phenomenon. Users are toiling elbow to elbow with technology specialists, shouldering new levels of responsibility—and burden—for IT activities, and plumbing the bracing complexities and invigorating opportunities that go along with finally being freed from the need to beseech an IS monolith for dribs and drabs of deliverables.

In fact, in some cases the deliverables aren't even delivered anymore; they're already here, being grown out back in the new-style departmental hot-house. Being able to seek local solutions gives a division unusual flexibility, especially when corporate IS is swamped with other business.

STORYLINE

Users have long complained that centralized IS is aloof, unresponsive, glacially slow and pays little heed to their business needs. In the best of all possible worlds, they argue, users would exercise substantial control over the resource, vanquishing application backlogs and rapidly creating new systems that add value to their business. In many organizations, this best of all possible worlds has been at least partly achieved. The dragon of rigid central control has been slain. And if the users don't exactly rule their own IT kingdoms, they're definitely making serious inroads. So, now that they've got what they said they wanted, are they satisfied with the results?



3M

Ron Zignego is the administrative systems manager for the commercial office-supply division of 3M Co., in St. Paul, Minn. His job is to support division sales and marketing people with systems and customer services that meet the needs of end customers. As only one of roughly 50 3M divisions, Zignego's group competes for corporate resources that are sometimes frustratingly scarce. While he is a scrappy competitor for corporate attention ("a pain in the side," as he put it), it's always good to have a Plan B stashed away.

"When I go to corporate," Zignego said, "I give them an option: 'This is what I want. If you can't do it, we'll do it ourselves.'" What Zignego hears that corporate may not is the insistent drumbeat of his external customers' clamor; corporate hears the clamor of internal users. "They have 50 divisions to deal with," said Zignego,

"whereas we have one."

Zignego's division has its own IS unit, headed by information systems manager John Winterhalter. Many of the systems it develops involve customer-focused EDI applications. Zignego especially values Winterhalter's understanding of the division's customers and their needs, a perspective that greatly improves the communication process.

"He trusts that what I'm saying is a real-live request," Zignego explained. "Corporate is a step removed and says, 'You have to tell me two or three times.' John says, 'I understand.' He can relate to me much faster than corporate can. He can also determine whether we've got the internal resources to make [a proposed project] happen."

According to Zignego, this economy of effort applies more or less across the board. "Internally, IS delivers for me," he said. "At corporate, I'm delivering 50 percent of me and they 50 percent to me. I'm giving them an awful lot by showing them what they need to do over there. They have to

"When I go to corporate, I give them an option: 'This is what I want. If you can't do it, we'll do it ourselves.'"

—Ron Zignego

get on the bandwagon by showing me more instead of making me ask for it all the time."

Zignego's division was developing customer-focused information systems before corporate IS saw their value. "We have an interesting relationship, because [corporate IS] used to see me as a pusher...asking for things they weren't planning to do or didn't feel were a priority or important. I have had to convince them that it's not me asking; it's the customers." Zignego's entrepreneurial approach to IT may have rubbed off on corporate IS. Now, he said, "we're getting a lot more yesses from corporate because they see how right we were about how important our customers are to the company."

But perhaps the most valuable benefit local autonomy gives a division is the option to allocate resources flexibly. At 3M, as at other companies, functional and divisional budgets are being squeezed tight. But while pressures on the corporate IS budget may translate into fewer or less-ambitious projects, Zignego's division can increase IT spending while cutting elsewhere.

Perhaps the most valuable benefit local autonomy gives a division is the option to allocate resources flexibly. When functional and divisional budgets are squeezed, the pressure applied to the IS budget may translate into fewer or less-ambitious projects. But at the divisional level, IT spending can actually grow while cuts are sought elsewhere.

"We recognize that IT costs have to expand because providing information to our users has gotten to be more and more critical," he said. "We're buying more systems, more and more PCs. It's a growing area." And to pay for the added IT investment, the division is cutting back on sales representatives. Part of the reason such cutbacks are tolerable is that technology has extended the reach of the sales force. "We have more coverage from St. Paul with the information tools we're developing," Zignego said.

In a sense, then, IT does double duty as both a tool for divisional growth and as a way to help pay for it.

Phillips Petroleum Co.



At Phillips Petroleum Co., Colln D. Wilkinson probably deserves credit for being an inventor of dispersed IS. Wilkinson, now vice president of exploration for the Bartlesville, Okla., company, found himself plunged into IS wonderland in the mid-1980s, as an end user charged with addressing perceived communication gaps between unmet twains.

"I was put into the IS organization as a manager of our technology systems-development division," said Wilkinson. "I was supposed to try to make them understand what the users wanted, not what they *thought* the users wanted. I can't even spell Fortran. [The experience was] a shock for me and a bigger one for them."

What Wilkinson found was a hierarchical arrangement whereby field scientists passed systems requests up to central IS through the R&D organization, which more or less translated and brokered the requests. Eventually, systems were passed back down. "The IS group wasn't close enough to the activity to understand what the users wanted," said Wilkinson. "They tried to provide a service, but it was difficult.... This is the way you build a camel."

Wilkinson soon eliminated his own job, disbanded the corporate systems-development operation and pushed development out into the operating units. ("Popular guy," he said of the move.) To Wilkinson, it made more sense for software developers and systems analysts "to be directly in contact with the people asking for support."

So far, he said, "it's been a great success." The benefits of closer contact cut two ways. Not only does the IS emissary

become more knowledgeable about and responsive to business needs; the users get a better sense of the value and limits of IT. "The user needs a better understanding of software and systems development so that he doesn't make unrealistic demands. The users are a lot more realistic about the investment. If they get a cost estimate, they know whether it has value." Wilkinson noted that in the bad old days, when the costs of processing were borne by central IS, there was nary an effort to link the costs incurred to the value delivered.

If he sees a downside to dispersing IS authority, it's the development over time of unregulated "individuality." Without some degree of coordination, some people will make eccentric adaptations to existing systems or will implement systems for which no one else has any real need. "And that becomes difficult to support," he said.

There is also the problem of information ownership. Once the data genie is out of the bottle, people sometimes become proprietary about "their" information. "That's both a good and a bad thing," Wilkinson said. On the one hand, the user will main-

tain the database. On the other hand, data sharing might be the first casualty of closely held data ownership.

To combat that, said Wilkinson, "we've emphasized teamwork in everything that we do. As we have a project, we'll pull together individuals with various disciplines and backgrounds to work together, so they've all got to share data." The inducement is for each team member to gain access to the wider universe of information represented by the other members.

Phillips is betting solidly on workstations and the client/server architecture as the medium for distributing data. And there's a large project now underway to unite the company's disparate geological, geophysical, engineering and accounting databases. (Wilkinson calls the project a "giant undertaking.") Access to these resources has heretofore been so klunky and time-consuming that their full exploitation has been greatly hampered. But once all that rich stuff is floating around out there on users' desktops, easily accessible and manipulable, the test of decentralized IS will be truest—and perhaps most promising.

Under decentralization, "the user has to have a better understanding of software and systems development so that he doesn't make unrealistic demands."

—Colin D. Wilkinson

Return to Sender

.....
It might just be a little premature to close that last data center ...

Contrary to what the average embattled CIO might think, users don't want everything. They only want what they want. And what they don't want covers a lot of territory.

Mostly, they want to control what's theirs, but not what's shared across the organization. From a cost perspective, it makes sense for a central IS group to handle the creation and maintenance of corporatewide systems, because it can achieve economies of scale that dozens of divisions developing their own systems cannot. The hypo-

thetical bottle-cap division in Mahwah isn't going to want to run the global network. As one user put it, "There goes my profit sharing."

User departments also don't want the cost of keeping legions of technical experts on hand for every conceivable application. Instead, they are content to draw on what Robert Morison, vice president of CSC Index in Cambridge, Mass., called the corporation's "economies of expertise."

At Phillips Fibers Corp., based in Greenville, S.C., President Jack Stripling is glad for the chance to use the parent company's mainframe systems when it's cost-effective to do so and, thus, preserve divisional resources for more mission-critical systems.

Even the most zealous decentralization proponents find the idea of developing and interfacing their own E-mail systems daunting. Users agree that a central group with a view of the entire organization—and the clout to set standards and

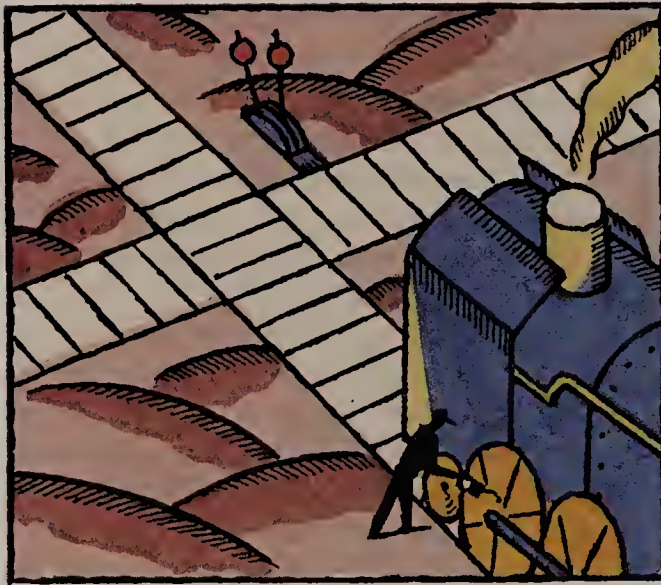
handle interfaces between disparate corporate systems—is best suited to manage such enterprisewide applications. The same is true for a business's links to the outside world. EDI projects at decentralized companies tend to be companywide to assure that customers encounter a consistent, easy-to-use company interface.

Users are also aware that decentralized IS environments give them a lot more responsibility, some of which they don't relish. "The main advantage of local data is speed of access by the computer application," said Dennis Neff, senior principal research geophysicist at Phillips Petroleum. "The disadvantage is that [this arrangement] requires me to be my own data manager, my own resource person and my own tech-support person—which is something I don't want to do.... We're here to find oil and develop oil, not to manage data and to have to learn a new operating system every time one is released."

"Users now have much better control of processes.... You can affect your own timing. In the past you were always at the beck and call of IS for certain things."

—Lizz Hall

Del Monte Foods



Del Monte Foods is a seasonal business and an organization whose various plants and divisions span time zones. So, besides having an information-processing load that rises and falls with the harvest schedule, it also has some Easterners busy working while the Westerners are just waking up, and Westerners still at work while the Easterners are digesting dinner.

In such a situation, the impact of a centralized IS structure, operating aloof from local outposts, can be debilitating operationally as well as strategically. Consider the annoyance and lost productivity of having a Del Monte accounts-payable system go down in DeKalb, Ill., at the start of a 5:30 a.m. shift and needing the intervention of a help desk in San Francisco that won't be open for four more hours. "Half of our day would be gone before people got to work," said Ronald R. Frakes, plant controller at Del Monte's DeKalb operation.

Before a decentralization and downsizing effort was undertaken in 1990, Del Monte's processing and IT-support activities were handled from the company's San Francisco base. Thirty plants across the country were required to transmit data to San Francisco every day for batch processing, a task that Frakes describes as being "like planes waiting to land at O'Hare."

With the downsized systems now in place, processing occurs as an online rather than a batch activity, so there's no more daily uploading. And IT support has been dispersed. Specially trained users provide front-line help-desk support for groups of plants in the same region. When the system was

first implemented, this local support person's time was 100 percent consumed in troubleshooting activities, said Frakes, "but now it's just 15 minutes a day." Frakes's staff gets help almost instantaneously when it runs into a systems problem.

Del Monte's central IS contingent is freed from these mundane concerns to focus on more-strategic applications—for example, said Frakes, a system to estimate the likely yield in cases-of-peas-per-acre-of-land under varying weather and soil conditions.

Still, some users would like to wrest a bit more IS responsibility from the corporate group. Lizz Hall, a senior accountant at a Del Monte division in Stockton, Calif., thinks corporate is "still hanging on a little. It's a lack of trust"—though she hastens to add that, overall, "they're beginning to trust the users more."

Hall, whose job includes overseeing the "raw-product" payments Del Monte makes to fruit growers, said the combined impact of downsizing and decentralization has streamlined her operation, increased efficiency, and reduced delays and error rates. "Users now have much better control of processes.... You can affect your own timing. In the past you were always at the beck and call of IS for certain things."

At Hall's division, most computing services have been outsourced to Electronic Data Systems Corp. (EDS) in San Francisco. IS team leaders within the division are Del Monte people who, according to Hall, are "very well-acquainted with plant personnel, know our needs and have made a lot of on-site visits." Programming requests are passed to EDS through these team leaders, whose role, said Hall, is "to be more representative of the actual user rather than an IS department."

While the sense has been dispelled that IS is some sort of "mystical tower in the sky," Hall said, "we'd like more independence and autonomy." She particularly wishes users could have more flexibility and freedom to manipulate output data and create new kinds of reports.

"We're still in the process of changing, evolving," she said. "There used to be a lot of antagonism" between users and IS, which she said often arose when users were told their requests could not be fulfilled because of the limits of the technology. "[But] downloading the responsibility has allowed us to look at things from their perspective," she said. "There *were* certain things that we really couldn't do." ☐

NEW FOR '93—WEDNESDAY AUGUST 11

THE EXECUTIVE CONFERENCE ON GROUPWARE

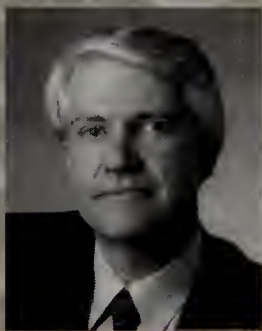
The Executive Conference on Groupware will be presented at Groupware '93 (August 9-12)
San Jose Convention Center, San Jose, CA



Dr. Marvin Manheim

8:30 am
Groupware: A Business Strategy Opportunity
Dr. Marvin Manheim, Professor, Kellogg Business School (Executive Conference Chairman)

A careful management approach uses business strategy goals to drive the planning and implementation of groupware applications. This presentation will illustrate how a company can develop competitive strategies using groupware.



Tom White

9:30 am
Using Workflow to Improve Business Processes; Case Studies
Tom White, CEO, Action Technologies

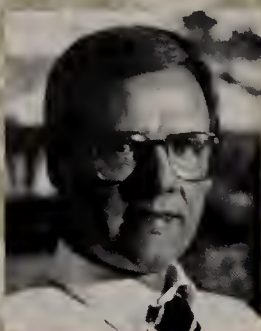
Mr. White will provide attendees with a strategic overview of workflow and a behind-the-scenes look at three companies that used workflow to re-evaluate and re-engineer their business processes.



Chris McGoff

11:00 am
The ROI of Workgroup Computing
Chris McGoff, VP, GDSS, Inc.

This presentation will examine three models used to plan, justify and analyze the integration of workgroup technologies. An ROI matrix from Lotus, Microsoft and Beyond Technologies will be presented in addition to company case studies.



Robert Johansen

12:00 Lunch Presentation
Global Groupware: A Status Report
Robert Johansen, Leader, Groupware Outlook Project, Institute for the Future

Mr. Johansen will present the results of research on global and cross-cultural teams. This research suggests that many executives are out of synch with the realities of global work—even in their own corporations. The presentation will focus on lessons learned and rules of thumb for executives to use.

A full day of presentations featuring speaker-audience interaction, this conference is designed for upper management and executive-level decision makers.

The Executive Conference on Groupware focuses on the practical and financial aspects of groupware technology.

Participants will leave the conference with a realistic view of groupware capabilities and the issues to be considered before a groupware implementation.

Each attendee will be given a bound copy of the conference presentations and a set of conference audio tapes.



Terry Jones

1:00 pm
Groupware at American Airlines
Terry Jones, President Sabre Services, American Airlines

This talk will detail American Airlines' experiences with workflow and group decision support systems over the past three years.



David Bess

2:00 pm
Groupware and Collaborative Technologies: the EDS Experience
David Bess, Director, EDS Center for Advanced Research

Groupware tools hold great promise for organizational learning and executive decision support. The challenge is to turn strategic planning into strategic management, and strategic decisions into implementation. Mr. Bess will discuss the role these technologies had at EDS and GM.



Chris Peckham

3:30 pm
Groupware Strategy and Customer Service at British Airways
Chris Peckham, General Manager Crew Resources, British Airways

British Airways initiated a business process redesign for Operations Planning and Control (OPAC) for planning British Airways' schedule and for managing daily operations. The redesign process noted that various key resources were needed to improve collaboration. A pilot study was done using Lotus Notes. The results of this study will be discussed.

4:30 pm
Summary of Key Points and Call to Action for Managers
*Dr. Marvin Manheim
Robert Johansen*

5:30-7 pm
Cocktails & Hors d'oeuvres in the Groupware '93 Exhibit Hall

Co-sponsoring Publication



CALL 1-800-247-0262
for registration information
and a full brochure on
GroupWare '93



The Executive Conference on Groupware: \$595

GroupWare '93 with Tutorials and Executive Conference: \$1295

Not All Talk

Computer-telephone integration is spreading to more organizations, and voices that once cried in the wilderness are now accompanied by all kinds of customer-specific information

BY LUCIE JUNEAU

Until recently, only companies running large telephone-intensive operations such as sales, customer service, market research, and credit and collection activities could enjoy the benefits of computer-telephone integration (CTI). Although applications linking data and voice typically offered payback periods of a year or less, they were difficult to develop and implement. And the initial cost of launching such applications, starting at about \$500,000, was often prohibitive.

Major development efforts by prominent vendors in the PC market are bringing the economics of CTI down to earth and establishing the technology's viability in the LAN and desktop markets. In January, AT&T and Novell announced the development of the Telephony Server NetWare Loadable Module (NLM), a product linking NetWare LANs and AT&T's Definity PBX Communication Systems. The module, to be released by the end of the year, will

provide server-based telephone-management capabilities to any workstation linked to the NetWare LAN.

The applications programming interface (API) on which the Telephony Server is based is currently available to software developers and switch vendors. Last May, Intel and Microsoft announced the development of a separate API, which will open up the development of data/voice-integration products for PCs running Microsoft Windows.

Although the technology represented by these announcements isn't new, the participation of heavyweight computer vendors legitimizes CTI and is expected to fuel a rapid growth in the market, which has grown more slowly than vendors and experts had expected. The APIs emerging from these partnerships will constitute de facto industry standards that software developers can build on to develop telephone-enabled software products for open environments. Soon, products linking telephone and computer technologies may be populating the LANs and desktops of average PC users.

The year 1993 may go down in computer history as the year the telephone met the PC. At a fraction of the cost of their mainframe- and minicomputer-based predecessors, CTI software products for the LAN and PC environments will be much easier to cost-justify and implement, experts say. Barriers to adopting the technology will crumble. "You could easily go to [a retail outlet], buy [a desktop] application and load it into your PC," said Jim Burton, principal of C-T Link Inc., a Boston-based consulting firm specializing in CTI. Smaller companies that haven't been able to afford CTI will be able to set up small-scale call or service centers mod-



eled after their larger counterparts. And many CTI features now available in call centers will be redeployed by knowledge workers at desktops across the enterprise.

Rudimentary CTI features include the ability to retrieve a telephone number from a database and dial it automatically from the computer, the ability to capture and apply knowledge about incoming calls in order to route them appropriately and link them to information in databases, and the ability to manage messages that have come in through a voice-mail system on the computer screen. CTI also creates the ability to treat voice messages as elements that can be integrated into traditional data files: A voice note could be appended to a spreadsheet file, for example.

The applications used in large call centers today rely on switch-to-host technology. A cable, typically providing T1 or X.25 communications, links a company's PBX system with a computer host, usually a mainframe or minicomputer. On the host side, software such as IBM's Callpath—supporting IBM mainframe, AS/400-minicomputer and RS/6000-workstation platforms—provides a variety of integration functions. (Digital Equipment's Computer Integrated Telephony—or CIT—another popular host-based interface, can be used on any platform running DEC's VMS or Ultrix operating system.) This host-based software communicates with telecommunications software on the PBX side. Each telecommunications vendor provides its own software: Northern Telecom offers Meridian Link; AT&T offers CallVisor ASAI; and ROLM offers CallBridge.

Smaller application vendors such as Littleton, Mass.-based Nabnasset Corp. offer middleware applications that take advantage of these switch-to-host links, sitting on top of host-side interfaces such as Callpath or CIT to provide advanced CTI capabilities. Nabnasset offers the Voice-Enhanced Services Platform (VESP), a set of software modules for sophisticated in-bound call centers.

Telecommunications vendors such as AT&T and Northern Telecom al-

so offer their own applications solutions. In conjunction with its Meridian 1 PBX platform, Northern Telecom offers a suite of products called Visit Access that includes Visit Voice, a personal call manager. Macintosh or PC Windows users with Visit Voice can store up to 32,000 entries in directories that they can use to facilitate point-and-click automatic dial-

The ability to identify callers before answering the telephone and to link data to incoming calls will be especially useful to PC users in marketing or sales positions at small organizations.

ing. They can also access voice-mail features from their desktops.

Another Visit Access product, Visit Video, offers videoconferencing capabilities. Host-side interface vendors such as DEC and IBM also offer applications solutions.

The Telephony Server announced by Novell and AT&T requires one server-based adapter card and wiring between the server and AT&T's Definity PBX. The API is based on the Computer Supported Telecommunications Applications (CSTA) standard developed by computer vendors associated with the European Computer Manufacturers' Association. The standard provides for monitoring and control of PBX telecommunications services. Switch manufacturers that wish to support the standard will write drivers to map their switch protocols into the CSTA interface; software developers will write applications conforming to the CSTA-based API. About 60 software de-

velopers are currently working with that specification to develop products.

The Intel/Microsoft API originated in the Architecture Development Lab within Intel's software technology group. Called the Windows telephony application programming interface (TAPI), it provides a common interface between the computer and a variety of proprietary phone-switching devices. ROLM, Northern Telecom, AT&T and others have announced that they will support it. Although the API is for desktops only, it will be extended to server environments in the future. Like the Novell/AT&T API, TAPI will be supported by both switch vendors and software developers.

Northern Telecom will soon support TAPI—in addition to its own desktop API—within Visit Access. The move will allow third-party applications conforming to TAPI to run within the Meridian 1 PBX environment, which may expand the CTI capabilities of Northern Telecom's Visit Access users. C-T Link's Burton expects to see a number of software products supporting TAPI by the end of the year.

As CTI capabilities pop up on PC desktops, users will begin to sample the CTI innovations first introduced by switch-to-host software vendors. Using automatic number identification (ANI) to identify a caller's phone number, and the dialed number information service (DNIS) to identify the number the caller dialed, products such as Nabnasset's VESP can build profiles that can be used to match callers with appropriate operators. If the package can't obtain the information it needs automatically, it forwards the call to a voice-response system that asks the caller for additional information.

It remains to be seen how capabilities of this type will translate to the world of the average PC user, whose use of the telephone is less intensive. Certainly, the ability to identify callers before answering the telephone and to link data—such as

records reflecting previous interactions with a caller—to incoming calls will be useful, particularly to PC users in marketing or sales positions at small organizations. As the phone rings, the caller's identity and customer data will appear on the PC user's screen. A few vendors, including Carlsbad, Calif.-based Remote Control International, offer voice-enabled, PC-based "contact management" packages for salespeople who need to automate communications with their customers.

Some of the first products to emerge for PC users will be applications for standalone PCs similar to Northern Telecom's Visit product or AT&T's PassageWay, according to Burton. PassageWay, a personal information-management package, offers desktop utilities including a rolodex feature. Numbers stored in the rolodex file can be dialed automatically from the PC.

PassageWay currently supports AT&T's proprietary desktop API but will also support Microsoft's TAPI in the future. Other personal information-management packages on the market include Jensen-Jones Inc.'s Commence.

In the long run, even the most telephone-phobic PC users will be affected by CTI. The PC will be the universal business-electronics appliance, said Ken Harper, industry analyst relations manager at Intel. "Within the next few years, we could conceivably see one device on a businessperson's desk—a PC with a headset. The PC will become your phone."

Given the mixed feelings most people have about voice-response systems, any improvements to them would be welcomed, vendors and analysts say. Some CTI applications may be useful for enhancing existing voice-mail capabilities. Products such as ROLM's Call-Com, for example, allow users to review voice-mail messages by providing a visual display on their PC monitors.

Users can click on an icon from their Windows menu to call up a list of their messages. They could then

select the messages in any order, rather than listening to them sequentially. When a user selects a voice message, the phone speaker will play it back.

Active Voice Corp. offers a software/hardware voice solution called TeLANophy, marketed in conjunction with its Repartee voice-mail system. TeLANophy supports an early ver-

*Within the next few
years, we could
conceivably see one
device on a
businessperson's desk—
a PC with a headset.
The PC will become
your phone."*

—Ken Harper

sion of the Intel/Microsoft TAPI and includes a feature called ViewCall that provides Repartee voice-mail users with more control over their incoming calls. A signal (a small window popping up in a corner of the screen, for example) alerts the user when a call is coming in. Without answering the call personally, the user can ask the caller to hold, route the call elsewhere or ask the caller to leave a message. A View-Mail feature lets users see a list of their voice messages on the screen. Fax-mail and E-mail messages can also be listed.

Integrated messaging products will be among the first popular PC applications of CTI, Burton said. Such products will display all messages—including voice mail, E-mail, facsimile and video—on the user's screen simultaneously. That capability may be particularly valuable to travelers: A user on the road could call in to the home office to get a list of messages, then download only the most important, saving both time and

telecommunications costs.

The market for LAN-based CTI products will open up as power users begin purchasing desktop products for their own use, according to Burton. "The department head will say, 'Why can't I have that?' Then IS will figure out that it can put in a LAN version [of the product]," he said.

Server-based solutions will offer definite advantages. Because it is server-based, the AT&T/Novell interface will enable third-party call control. That means that the LAN could act as a receptionist, forwarding incoming calls—and any data relating to the caller—wherever appropriate with the help of caller-identification information. That kind of server-based routing control could be useful to organizations using 800-numbers, for example. The third-party capability could also allow a worker to monitor, answer or forward calls coming into a colleague's desk.

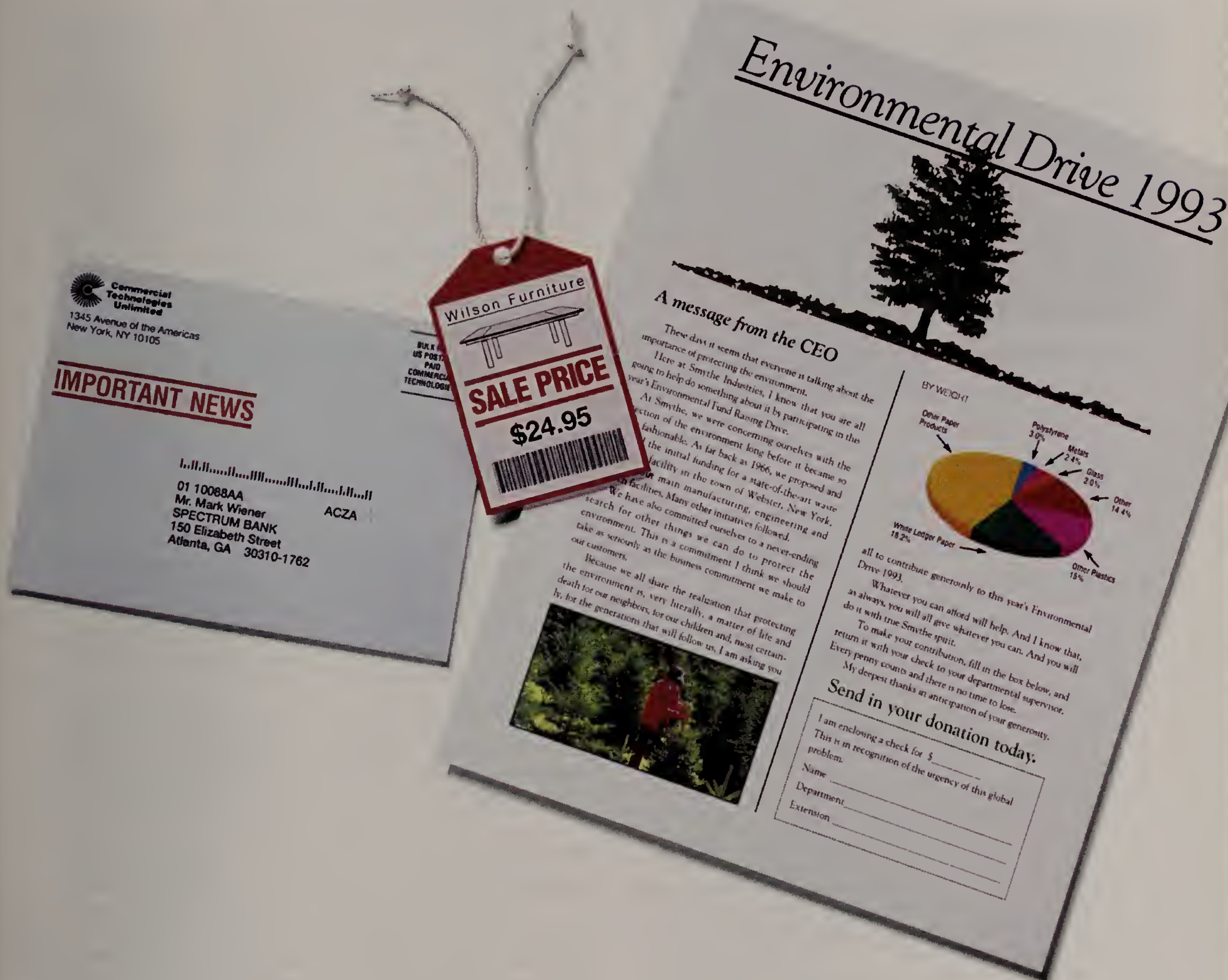
Microsoft has announced that it will provide a server version of its own API at some future date. Furthermore, the AT&T/Novell interface, unlike the Intel/Microsoft solution, does not provide for a voice capability. The specification therefore does not address the needs of a PC user who wants to, say, include a voice note with a spreadsheet file. In order to meet that need, retailers providing LAN interfaces complying with the AT&T/Novell specifications will probably install voice boards—manufactured by companies such as Parsippany, N.J.-based Dialogic Corp.—along with their server cards.

As CTI products begin to proliferate across organizations, CIOs will want to ensure that they are implemented properly. Products that tie into corporate databases to retrieve information at the desktop must be closely monitored by IS managers. With careful oversight and a little luck, voice-enabled applications may eventually improve personal productivity. ☐

Lucie Juneau is a freelance writer based in Salem, Mass.

XEROX

How to push the envelope, pick up the tab, and put the check in the mail.



Business documents are supposed to elicit some kind of action, whether it be to make you open an envelope, buy a product, or simply take notice.

Unfortunately most seem designed to do just the opposite.

What can help? Simple. The intelligent use of color. Numerous studies show that color gets invoices paid 30% faster, increases advertising readership by more than 50%, and raises brand recognition by up to 70%.

At Xerox we're committed to making high-productivity color available to everyone. With a range of products and systems that are right for both small businesses or large organizations, and the backup and support that make Xerox relationships work.

Products like the Xerox 5775 Digital Color Copier/Printer that's 50% faster than anything you can buy. Or our Xerox 4700 Color Document Printer that prints and collates both black and white and color on a single networked printer. And the Xerox 4850 HighLight Color Laser Printing System, our 50-page-per-minute printer, that adds spot color to variable data for increased effectiveness and higher impact.

Xerox can make color work for you, for less than you might imagine. So start making a colorful impression. Call us at **1-800-TEAM-XRX, ext. 740.**

Xerox
The Document Company

FRONTLINE



BY PORTIA ISAACSON

Each phase of IT development—from mainframes to minis to desktops—has had its clear market leaders. If IBM is history, who will lead us now?

The Fourth Era

NOMADIC COMPUTING

There have been three eras of computing. IBM led the mainframe era, while Digital Equipment led the minicomputer's reign. IBM was the leader in the early years of desktop, too, but then it abdicated by challenging the steamroller standard it had created around Microsoft's DOS-Windows, Intel's x86 and ISA (industry standard architecture) with the who-cared innovations MCA (micro channel architecture) and OS/2.

Today it is clear which desktop-computer companies created real value in the desktop era. Microsoft and Intel, with their operating systems and microprocessors, have the market-controlling intellectual property, and legions of hardware manufacturers worship at the shrine of Microsoft/Intel compatibility. Although the profits of the legions have bled to red in the commodity market created by unimaginative companies, end users rejoice in their new freedom from tyrannical proprietary rule.

We are now entering the nomadic era. By the end of the century, nomadic computers and communicators will be everywhere. Nomadics include notebooks, subnotebooks, palmtops, pen computers, convertibles, personal digital assistants (PDAs) and personal communicators. Desktop computers, servers and even PBXs will have been re-architected with nomadics functioning as the system design center.

The big question: Which of the following operating system/CPU architectures

will lead nomadic computing and communicating?

- ▶ Windows derivatives such as Microsoft's rumored Win-Pad and Intel's x86
- ▶ Apple Computer's Newton operating system and Advanced RISC Machines' ARM
- ▶ GO Corp.'s PenPoint and AT&T's Hobbit
- ▶ GeoWorks' GEOS and Intel x86
- ▶ General Magic's MagiCAP

and Motorola's Dragon

- ▶ A yet-to-be-ru-mored IBM offering (today's OS/2 is surely no candidate)

Which OS/CPU will lead the nomadic era? If you assume it will be Microsoft/Intel, better look again. The paradigm shift to nomadic computing now underway is not an evolution. It is a market disconti-

nuity of that rare type that creates and destroys companies along with the computer architectures to which they swear allegiance.

Lessons from History

THE RISE AND FALL

Consider the three paradigm shifts that, relative to the state of computing at the time, were of comparable magnitude. Computing started with the mainframe era, which created IBM and other companies we barely remember. The shift from mainframes to minis spawned important new computer architectures and companies—particularly VAX and Digital. The shift from minis to desktops spawned the first merchant-market OS/CPU pair (Microsoft DOS-Windows and Intel x86). DOS/x86 became so economically power-

ful, with the legions of third-party compatible products it fostered, that it brought the rulers of both the mainframe and the mini eras (IBM and Digital) to their knees.

Today we stand at the door of the next paradigm. The first nomadics (notebooks) were shrunken desktops. The emerging generation is very different:

- ▶ LCD-based architectures will put the logic on the LCD glass;
- ▶ Pen input necessitates a real-time, responsive operating system and dictates re-architecting the electrical as well as the mechanical design of the computer hardware;
- ▶ The weight and short life of batteries, along with processor-hungry graphical user interfaces, have made MIPS/watt the microprocessor-performance measure of choice; and
- ▶ High levels of integration of the CPU with other functions are required to achieve high performance, small size and low cost (less than \$2,000).

Will the end-user requirements, market forces and technological possibilities of nomadic computing be so different from desktop computing that a new and economically powerful computer architecture could emerge? I say, yes.

With each paradigm shift of the past, the leading companies of one era were not successful in the next. This is because the leaders of a given era experience their greatest growth and success at the exact moment the next era is being born. Arrogance and near-sightedness, fueled by record-shattering success, keep a

Minicomputers grew up to compete with mainframes but did not grow down to compete with desktops.

FRONTLINE

leader from seeing anything that could negatively affect its own product line. These conditions also instill in the organization a belief that the evolutionary downscaling of its own technology (for instance, a mini on a desktop, whenever the vendor got around to introducing such a product) would be preferred to any new, competing technology that got an early start.

Microsoft and Intel

TOO LITTLE, TOO LATE?

So if history is a guide, desktop leaders Intel and Microsoft may not be successful in the nomadic-computing era. Like Digital when desktops were being born, both Intel and Microsoft are preoccupied with the high end of their respective technologies (Pentium and Windows NT), while the low end goes begging. Intel even relinquished its nomadic product line (in which it invested \$50 million) to VLSI Technology Inc. (VTI) last year, and we have seen no more of VTI's efforts than we have of Microsoft's long-rumored WinPad. Microsoft's Windows for Pen Computing is strictly evolutionary. Intel and Microsoft may be so late that their offerings, like Digital's Rainbow, will fade into the technology Hall of Too-Late, Too-Evolutionary Forgotten Products.

Microsoft and Intel are a

formidable force. They will own most of the market for nomadics that require desktop applications in this first phase of the nomadic era. However, desktop computers will eventually be redesigned around nomadic architectures, and that is where Intel and Microsoft are vulnerable.

Compaq is trying its hand at leading the Microsoft/Intel legions into the new era. Compaq and Microsoft recently announced The Frontline Partnership (no relation, and no royalties either, unfortunately). In this partnership, the two companies will cooperate in many areas, including the design of new user-friendly products such as pen computers. Compaq's very name means small, and it got its start with a portable computer. But frankly, I don't see the required vision from Compaq that would compare to the vision that created Apple's Newton or AT&T's personal communicator. Even Compaq's rumored PDA, code-named Adam (Adam took a bite out of the Ap-

ple), signals a defensive strategy.

Well Connected

APPLE'S ADVANTAGES

Apple, which marched to the beat of its own drummer during the desktop era with a proprietary operating system, has astutely realized that its real competitors have been Intel and Microsoft, not IBM and Compaq. Apple's plan is to own, invest in or control the key intellectual property embodied in the Newton architecture (the microprocessor, operating system, and other key hardware and software components) and,

in addition to building and marketing its own Newton family, to license the Newton architecture to others.

Apple is lined up with Sharp, Matsushita, Toshiba, Motorola, Siemens and ROLM as Newton system manufacturers; ARM, VTI, Plessey, LSI

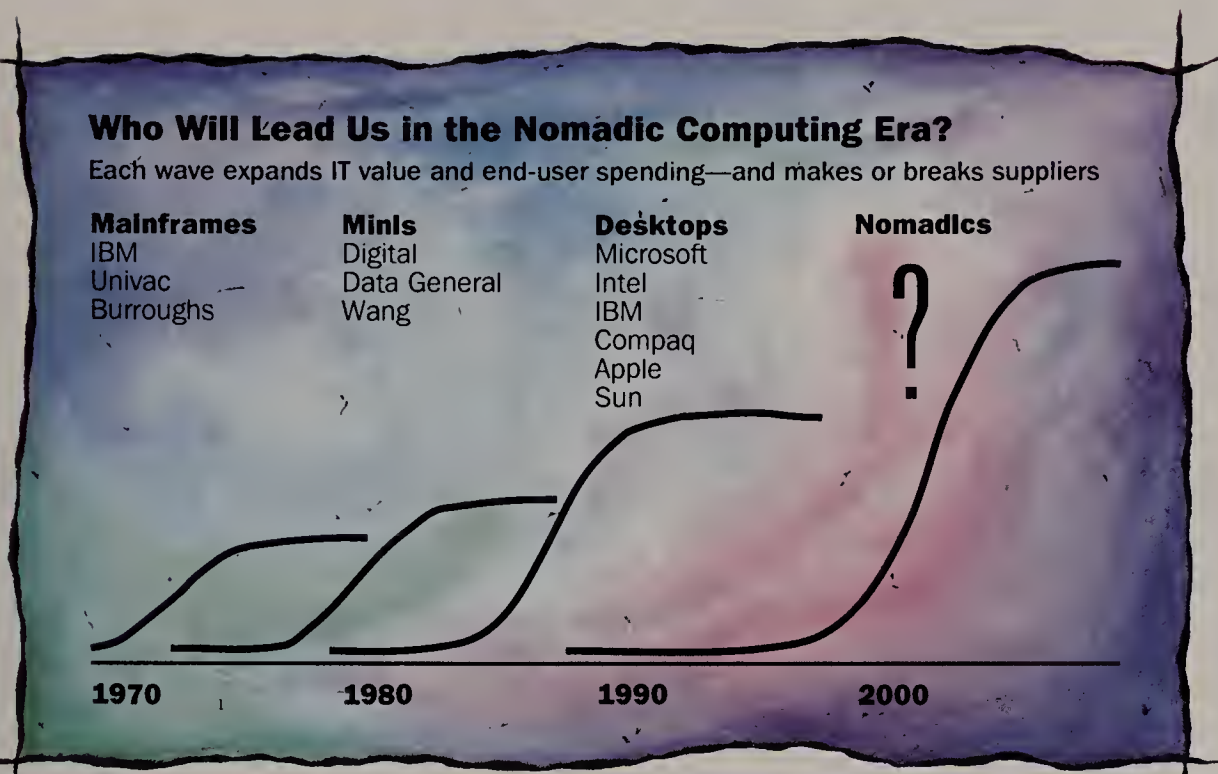
Logic, Siemens and Cirrus as chip suppliers; Scriptel as a pen/digitizer-technology supplier; and Paragraph as a handwriting-recognition

supplier. Apple's risk is the many layers of new technology and the new economic structures it is creating. The biggest hole, however, in Apple's as-yet not fully disclosed plan is the role it envisions for independent software firms. The powerful and innovative independent software community

made Intel and Microsoft what they are. Does Apple so envy Microsoft's position as premier application supplier for Macintosh that it would dare to alienate independents to assure its piece of the Newton application market? Possible, but surely a big mistake.

What about AT&T? In the past few months, PenPoint/Hobbit has lost momentum against Apple's Newton in the battle for market mind share, intellectual property and strategic relationships. AT&T's biggest assets are its Longlines Cash Machine and its telephone market. Does the fact that AT&T has never been a major market leader in any era of computing give it an advantage in the nomadic era? Maybe. AT&T has the needed cash and technology muscle to be a big player, but at this time Apple is way ahead in piling up the key chips that will ultimately decide the nomadic market. Not to worry—no matter where the nomadic chips fall, AT&T will likely get the lion's share of a greatly expanded communications market.

Tandy and Casio are en-



supplier. Apple's risk is the many layers of new technology and the new economic structures it is creating. The biggest hole, however, in Apple's as-yet not fully disclosed plan is the role it envisions for independent software firms. The powerful and innovative independent software community

I was at the crossroads.

My IMS system was running like a Swiss
tems are right 4 the future. I pondered this
a 4tune teller. "Seek more availability and
Move 4ward," she said. Mumbo jumbo, I
in the 4est. No answer was 4thcoming.
myself, I headed for a Chinese restaurant
I opened my 4tune cookie. Cracking open
I found the solution I had been 4ever

watch. But everybody says client/server sys-
tem is a dilemma **4** many weeks. I sought advice from
integrity. The solution is right in front of you.
I thought. To clear my head, I went for a walk
but I worked up quite an appetite. To **4**tify
At the end of an exquisite meal,
this crusty morsel,
seeking.



Order IMS/ESA® Transaction Manager Version 4 and get ten licenses
for IMS Client Server/2 Version 2 at no additional charge.*

New IMS/ESA® Version 4 from IBM Programming Systems not only gives you an extraordinary boost in availability and integrity. It gives IMS the flexibility of client/server technology.

With IMS Version 4 and new IMS Client Server/2™ Version 2 software, users can easily access existing IMS

applications from their own PCs. So everyone can be more productive.

Want to see the future of IMS? We'll send you a detailed IMS portfolio and infodisks. Just call 1 800 860-2047, ext. IMS4. Or contact your IBM representative.



IMS is part of the IBM Information Warehouse,™ an open client/server framework.

FRONTLINE

tering the PDA market with an entry based on GeoWorks' GEOS operating system, which runs on low-end Intel x86 processors. Due to debut this fall, the Zoomer incorporates GEOS' ability to zoom in on any part of a tiny screen with the touch of a pen.

GEOS is a tiny but very advanced architecture system (Microsoft could take a few lessons). It features a user-interface-independent API, which enables dramatically different user interfaces to be dropped in with no change to the underlying applications. In this way, applications can run unchanged on a GEOS-defined Macintosh interface, an OS/2 interface, a pen interface or a voice interface.

Does GEOS have a chance? Yes, albeit a small one—more if strange things happen. A farsighted IBM might adopt it for a blow-away line of PDAs designed atop its own version of the Intel x86. Microsoft might give up on its evolutionary products and buy/bless it. To really have an impact, GEOS needs more market leadership than Tandy/Casio will likely give it.

Motorola's Dragon and General Magic's MagiCAP are the latecomers. Do they have a chance? Probably not. A mythical beast, even with a magic cap, does not a market make. Motorola recently hedged its bet by becoming a part of the Newton family. Motorola will be a big player in communications components and services no matter which way the OS/CPU technology swings.

Apple's plan is to own, invest in or control the key intellectual property embodied in the Newton architecture.

Hope for IBM

SURVIVAL STRATEGIES

IBM, IBM, IBM. Sad, sad, sad. IBM's worries are not about whether it can lead the nomadic era but whether it can survive into it. Personally, I would like to see IBM not only survive but reassume a

position of leadership. Although I was disappointed (as were many others) that I was not chosen as IBM's new CEO, to show that I have no hard feelings, I present here my list of

IBM's most important dos and don'ts:

1. Don't listen to your customers; they got you into this mess. They just wanted you to keep their mainframes in great shape while they figured out how to downsize.

2. Don't listen to your employees. They tell you to do things that they know how to do. They see the world through mainframe glasses. Develop a test for mainframe-sightedness, conduct it, and aggressively outpace employees with any symptoms.

3. Buy NCR from AT&T. You need an Intel-architecture product line from PDAs to mainframes with all the workstations and minis in between. NCR has it. AT&T doesn't know what to do with it. You do. Aggressively phase out your proprietary systems in favor of ISAs everywhere.

4. Buy Dell—or at least really dissect the company to understand how your mail-order business is not like Dell's. Dell is a 21st-century model of new-age business concepts. It has an obsessive commitment to its customers. It has the

best account control (customer satisfaction and references) that can be achieved in today's computing market. It makes the most efficient use of its money (no channel inventory, manufacturing-to-order with JIT parts delivery), and it offers mass-customization as it manufactures computers to order within 24 hours. And that is just the tip of the iceberg that is sinking you.

5. Mend your fences with Bill Gates until a technology-ignited earthquake (e.g., nomadics) creates a market discontinuity so great that you can claim a new era. Going up against Gates in the mature desktop market has been silly and has not served your customers well.

6. Renounce your love affair with Apple. We all know that you wish you had been Apple during the desktop era so that you could have been more profitable with a proprietary system than you were playing in what you perceived as a commodity PC market. But you just didn't get it. You should have continued to lead the PC standard aggressively (as Don Estridge launched it prior to the mainframe-centric help the business unit received) into x86 servers and nomadics, with Microsoft and Intel as your biggest allies. But no, you didn't believe customers would prefer x86 servers to the point that they would chew up your mainframe and mini business. What do you think now?

7. Think paper, not TV. More mainframe thinking is devastating your future. You are staking your future on iron-intensive, desktop video multimedia instead of

on paper-paradigmed, communication-intensive, tri-media (data, fax, voice) nomadics. PDAs are no more toys than PCs were in 1977. You may think PC-based videophones or video-mail is the next big market, but you are wrong.

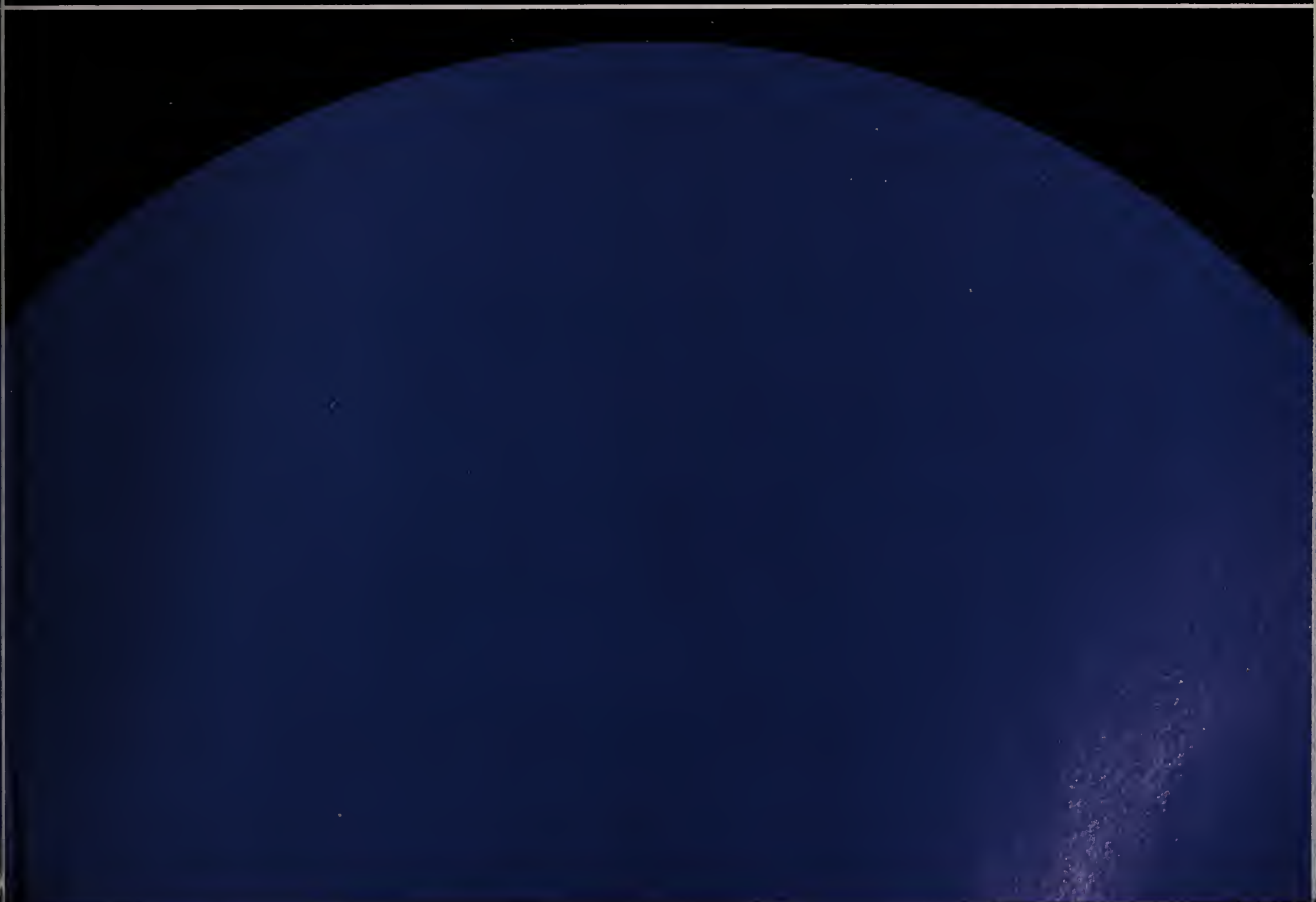
8. Don't sell (or spin out) your PC business unless you replace it by acquiring PC companies better suited to your future. A successful PC business unit is strategic, and you must have one. Make it profitable by more creatively pursuing an industry-standard leadership role instead of putting your head in too-late Apple sand.

9. Create a protected business unit for nomadics within the PC business unit. You had one but let it fade away. Nurture it. Fund it. Let it be creative. Don't overmanage it. Do not subject it to PC-volume requirements. Let it make deals. Let it create and acquire intellectual property. And move it! I hope it is not too late already.

The new industry forces of the nomadic-computing era will determine computing leadership in the early years of the 21st century. Every 15 years or so, the laws of relentless improvement in semiconductor technology—and the end-user possibility thinking they enable—shuffle the competitive deck. Old players die; new ones are born. Here we go again. ☐

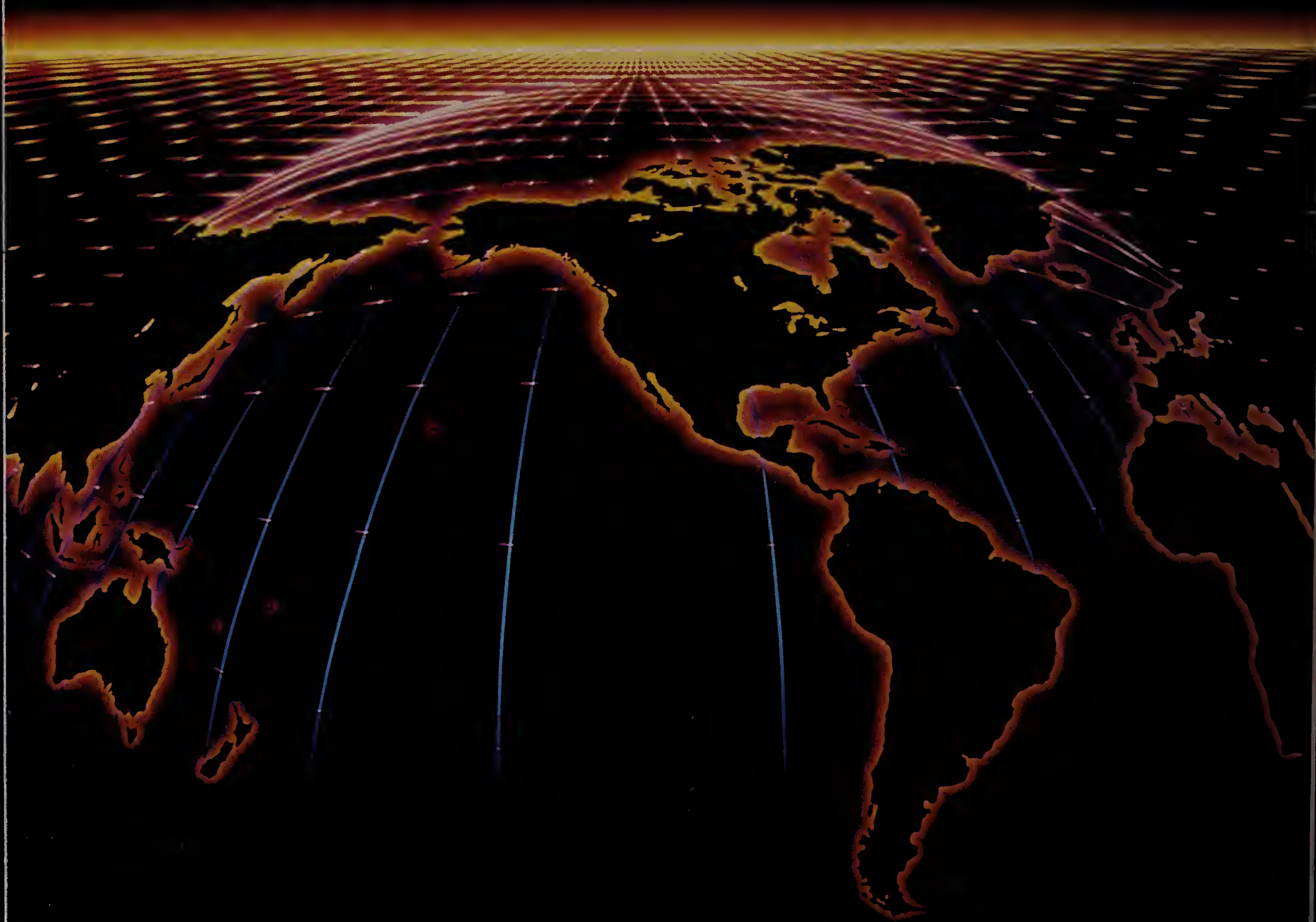
Portia Isaacson is president of Dream IT Inc., headquartered in Colorado Springs, Colo., a consultancy and publisher dedicated to providing quality business information to customers and creators of frontline IT.

**What's the
difference
between
Interop and
ComNet?**



Interop is local.

**ComNet is
global.**



Networking is the hot topic of the nineties, but who has time to go to a dozen networking trade shows?

The two big networking shows.

If you've got the time, you ought to be at both Interop and ComNet. If not, there's an easy way to decide which show is for you.

Interop is basically a local area network show focusing on technical "interoperability" issues. Important issues, to be sure, but not the big picture.

ComNet is a global internetworking show focusing on company-wide enterprise networking. It covers the latest technologies like ATM, Frame Relay, SMDS, FDDI, and mobile data communications that are shaping the new enterprise.

And deals with real-world solutions like imaging, voice, data, workgroup and database applications that are driving the technology.

Produced by IDG World Expo.

Furthermore, ComNet is produced and managed by IDG World Expo, the world-wide leader in professional conferences and expositions for the information technology industry...including ComNet Prague, EuroComNet and ComNet Korea. It is part of International Data Group (IDG), the leading global provider of information services on information technology.

IDG World Expo brings the full support of IDG publications including *Computerworld*, *Network World*, *Federal Computer Week*, *InfoWorld*, and *CIO* in providing exhibitors with the highest quality attendee promotion.

If your company is global, or thinking of going global, then ComNet '94 ought to be in your tradeshow plans. It makes good sense, since 45% of the people who went to ComNet last year already have multi-national networks.

Not just technical people.

ComNet is a show for decision-makers.

3Com's John Covert said, "What we're seeing are the principal network people who are really on the firing line,

or the people who have to make the decisions for next-generation technology."

Jim Warner, marketing director for the Network Management Forum and frequent ComNet participant said, "At ComNet the quality of attendee is very high. The collective purchasing power of ComNet's enterprise network management audience is unsurpassed."

According to the latest independent audience surveys of the two shows, 47% of ComNet attendees are from companies that spent \$1 million or more on networking equipment in 1992, vs. 36% for Interop Fall.

First show of the year.

Traditionally, ComNet is the launching pad for new networking products. At ComNet '93, half of the 450 exhibitors introduced 288 new products.

ComNet '94 will be held January 24-27, 1994 at the Washington Convention Center in Washington, D.C.

For information about exhibiting or attending, return the coupon or call **800-225-4698**.

☐ Send me **FREE ADMISSION** to over 450 exhibiting companies plus detailed information on global networking issues and solutions at the ComNet conference, January 24-27, 1994, Washington, D.C.

☐ Send me a **FREE EXHIBITOR KIT** with complete information on how to reach over 35,000 global networking decision-makers.

NAME _____

TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

COUNTRY _____

PHONE _____ FAX _____

Return to: ComNet '94, P.O. Box 9107, Framingham, MA 01701-9107. Or Fax to: 508-872-8237.

C13

COMNET '94

Entering the Global Age.

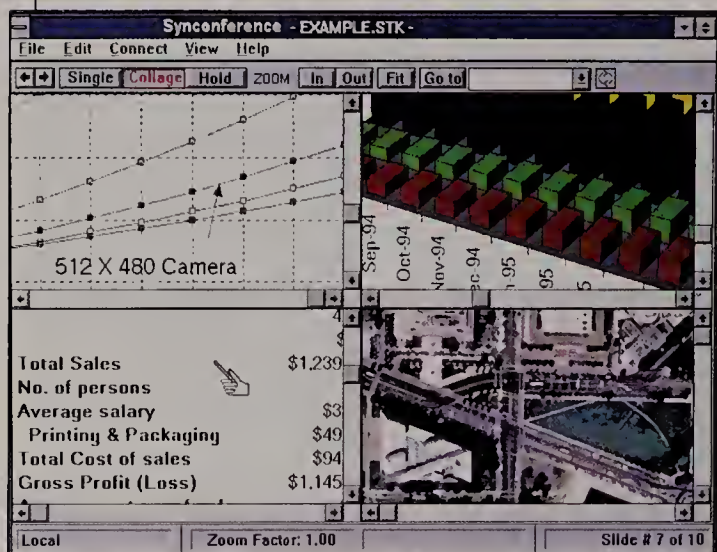
CONFERENCE AND EXPOSITION
JANUARY 24-27, 1994 • WASHINGTON, D.C.

FYI

And There's Millie in Front of the Taj Mahal...

Looking for a way to share your slides with more people? Modus Software Inc. offers a PC teleconferencing product that lets you present and discuss detailed, high-resolution still images and other soft documents remotely. Synconference is an end-user application for audio-visual teleconferencing on PC-ATs and compatibles running Windows 3.1. It works with a standard modem (1200 bps or higher) and regular phone lines.

Synconference acts like two remote slide projectors, with the presenter controlling both simultaneously. It offers zooming, panning and side-by-side display of multiple slides;



supports slide-stack file transfer; and lets presenter and listener easily exchange roles at any time. Drawings made on one side are replicated as they are being drawn.

The program automatically senses the display resolution of both machines and matches window sizes. Slides can be generated by any graphics or image-processing program that can save its images in BMP, GIF, TIFF and PCX bit formats, and users can create and rearrange slide stacks from various bit-map files.

Price is \$395. Call 415 964-1936.

A Port to Any Platform

Downsizing applications to a client/server environment requires resourcefulness and a steady hand at the helm. A new set of tools from Abraxas Software Inc., a developer of language-development tools for client/server, provides mechanisms to port old RPG, Cobol, Fortran, PL/1 and Basic mainframe applications to the new platforms. PCYACC 4.0 provides support for modern data-abstraction models such as RTF, ASN and SGML, as well as for client/server languages such as DAL, SQL, DB2 and SNA/LU.

PCYACC 4.0 generates object classes for syntactical, lexical and symbol management. It includes Borland C++ example applications with complete error reporting, handling and recovery resources.

The product is available for MS-DOS, Windows, OS/2, NT, Unix and Macintosh. A 32-bit version will compile any size grammar. Call 503 244-5253.

Touch that Dial!

The spreadsheet, a grid of interlinked numbers, can be a forbidding jumble to the non-actuarials among us. Manipulating the numbers means finding the right cell, retyping a value and wondering if it will affect the other cells the way you want. Wouldn't it be simpler to marshal these digits with the same comfortable controls we use to set thermostats, fire up the gas grill or tune in our car radios?

Startup firm Golden Technologies Inc. is hoping to fulfill this wish with Sliders & Dials, a spreadsheet subapplication that graphically depicts dials and sliding bars for use in cell-value manipulation. Just "turn" a dial or move the pointer up or down on a slider, and the assigned cell will change its value accordingly. Up to 14 dials or sliders can be assigned to specific cells in one Microsoft Corp. Excel For Windows spreadsheet. Users can manipulate the graphic dials and sliders with a mouse, eliminating the need to retype cell values. The suggested retail price is \$99.95; quantity discounts are available. Call 800 653-2201.

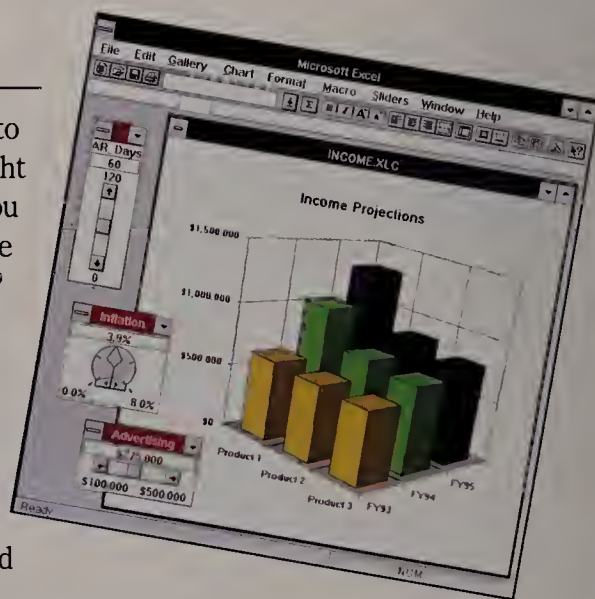
You Say Tomato

Unless you happen to find monotones appealing, computer-synthesized speech probably leaves you cold. If your text-to-speech telephone or desktop applications demand something a bit more humanlike, the Sound Bytes Developer Kit might be just the program.

Vendor Emerson & Stern Associates Inc. of San Diego asserts that Sound Bytes can replicate normal speech patterns such as pitch variation, intonation and correct grammatical pronunciation. By converting sentences rather than individual words into synthesized speech, Sound Bytes can create a voice with a natural rhythm and appropriate inflection.

Pitch, speech rate and pauses can be set using embedded commands, and natural parsing technology provides the ability to differentiate between words with identical spellings but different pronunciation depending on usage ("I have read" versus "I will read"). Developers can use the program to create specialized applications including multimedia presentations, computer-based training, interactive voice-response applications and remote telephone access to E-mail.

Sound Bytes is a software-only product available for OS/2 and Windows environments. Pricing for the kit starts at \$3,750 per platform, including a one-time developer licensing fee. Call 619 457-2526.



BUSINESS T O D A Y

The national television series, **BUSINESS TODAY** will explore a broad spectrum of issues in technology, manufacturing and finance. The following will be featured in a show titled,

"THE BITS & BYTES OF OFFICE MANAGEMENT"



A Pitney Bowes Company

DICTAPHONE

The voice of business for every business.

800-447-7749
xD560



LANNET, INC.

Future-ready, video-capable,
Intelligent LAN Hubs for Fail-Safe
Enterprise Networks.

800-LANNET-9



Ergonomic Computer Workstations

ERGOTRON, INC.

Providing space-saving work-
stations for any computerized work
environment.

800-888-8458



The Intelligent Choice in Data Communications

U.S. ROBOTICS, INC.

A world-wide designer, manufacturer
and marketer of data
communications equipment.

800-DIAL-USR



JOHNSON CONTROLS, INC.

Featuring Dynasty Batteries . . . One
simple choice.

800-628-1200
x825



The Document Company

XEROX CORPORATION

Fast becoming the color document
company.

800-ASK-XEROX

Tune in to "THE BITS & BYTES OF OFFICE MANAGEMENT"
on the Discovery Transponder, July 29, 1993 at 6:41 a.m. Eastern and Pacific Time!

WJMK, Inc. 2424 N. Federal Highway Suite 462 Boca Raton, Florida 33431 (407) 367-0703



I N D E X

Page numbers refer to the first page of the article(s) in which the company is mentioned. This index is provided as a service to readers. The publisher does not assume any liability for errors or omissions. Frontline, beginning on page 60, contains the name of companies too numerous to mention.

Company Index

Abraxas Software Inc.	68
Active Voice Corp.	56
AI Credit Corp.	72
American Airlines Inc.	28
American Express Co.	28
AT&T	56, 60
Booz, Allen & Hamilton	28
BSG Consulting Inc.	72
C-T Link Inc.	56
Cedars-Sinai Medical Center	14
Chase Manhattan Bank	38
Conoco	14
CSC Index Inc.	50
Data General Corp.	28
Del Monte Foods	50
Dell Computer Corp.	38, 60
Dialogic Corp.	56
Digital Equipment Corp.	56, 60
Emerson & Stern Associates	68
Epsilon	28
FamilyCare Software	14
Georgia-Pacific	50
Golden Technologies Inc.	68
Halliburton Services	14
Hewlett-Packard Co.	14
IBM Corp.	14, 56, 60
Information Technology	28
Intel Corp.	56, 60
InterStudy	14
INVESCO Funds Group	28
Jackson Hole Group	14
Jensen-Jones Inc.	56
John J. Davis & Associates Inc.	14
Kendall Square Research Corp.	28
Kmart Corp.	28
Lotus Development Corp.	38
MasPar Computer Corp.	28
MCI Communications Corp.	38
McKinsey & Co. Inc.	38
Microsoft Corp.	56, 60, 68

Modus Software Inc.	68
Monsanto Co.	38
MRJ Inc.	28
Nabnasset Corp.	56
NCR Corp.	28, 60
nCube	28
Neodata Corp.	28
Nolan, Norton & Co.	14
Northern Telecom	56
Novell Inc.	56
Oracle Corp.	28
Phillips Fibers Corp.	50
Phillips Petroleum Co.	14, 50
Price Waterhouse	38
Prism Solutions Inc.	24
Prudential Securities	28
R.D. Garwood Inc.	14
Remote Control International	56
ROLM	56
Silicon Graphics Inc.	14
Smaby Group Inc.	28
Southwestern Bell Telephone	14
Sun Microsystems Inc.	28
SuperSolutions	28
Sybase	28
Texaco Inc.	38
Texas Instruments Inc.	28
Thinking Machines Corp.	28
3M Co.	50
WildHare Computer Systems Inc.	28

Advertiser Index

Ameritech (Regional)	20A
Andersen Consulting	35
ARDIS	27
AT&T	25
Bell Atlantic (Regional)	9
BMC Software	C3
CIO Publishing	8, 13
Comdisco	7
ComNet	65
Computer Associates Intl. Inc.	2, 43
Data General	12A
Digital Equipment Corp.	C2
Groupware '93 Executive Conference	55
IBM Corp. (Regional)	8
IBM Corp.	4, 18, 62
Information Builders Inc.	11
Lotus Development Corp.	36
Open Connect Systems	17
QMS	23
SCO	15
Sybase	C4
Syncordia	21
Synon	45
Texas Instruments	33
WJMK	69, 71
Xerox Corp.	59

Editorial, Advertising and Business Offices: 492 Old Connecticut Path, PO Box 9208, Framingham, Massachusetts 01701-9208, (508) 872-8200. **Postal Information:** CIO (ISSN 0894-9301) is published monthly; and semimonthly in April, May, June, September, October and November by CIO Publishing Inc., 492 Old Connecticut Path, PO Box 9208, Framingham, Massachusetts 01701-9208. Second-class postage paid at Framingham, MA, and at additional mailing offices. **Reprints:** Copyright 1993 by CIO Publishing Inc. All rights reserved. Reproduction of material appearing in CIO is forbidden without written permission. Send all reprint requests to Permissions Editor, CIO, 492 Old Connecticut Path, PO Box 9208, Framingham, Massachusetts 01701-9208. **Photocopy Rights:** Permission to photocopy for internal or personal use or the internal or personal use of specific clients is granted by CIO for users through the Copyright Clearance Center (CCC), provided that the base fee of \$3.00 per copy of the article, plus \$.50 per page is paid directly to Copyright Clearance Center, 27 Congress Street, Salem, Massachusetts 01970. Please specify: ISSN 0894-9301. Permission to photocopy does not extend to contributed articles followed by this symbol: ‡. **Microfilm:** CIO issues and articles can be purchased on 16mm and 35mm microfilm and on 105mm microfiche through University Microfilms International, Serials Acquisitions Department, 300 N. Zeeb Road, Ann Arbor, Michigan 48106. **Subscriptions:** Address inquiries to CIO, 492 Old Connecticut Path, P.O. Box 9208, Framingham, Massachusetts 01701-9208. CIO is free to qualified information executives. To all others the one-year basic rate is \$78 for U.S. and Canada, \$175 to foreign countries (payable in U.S. funds only). The single copy price is \$7. Please allow 4 to 6 weeks for new subscriptions to begin. **Change of Address:** Please fax a copy of current subscription label along with new address to (508) 872-0618. Allow 4 to 6 weeks for change to take effect. **Postmaster:** Send change of address to CIO, P.O. Box 489, Northbrook, Illinois 60065-9816.

CIO Sales Offices

President and Publisher

JOSEPH L. LEVY
508 935-4601

Director of Advertising Sales

MICHAEL J. MASTERS
201 227-1140

Director of Marketing

CATHY O'LEARY HAYES
508 935-4521

List Services Manager

STEPHANIE LEGELIS
508 935-4433

Exec. Subscription Program Manager

NANCY A. O'CONNELL
508 935-4036

Sales & Marketing Specialist

BRIDGET CAMMARATA
508 935-4035

CIO Publishing Inc.

492 Old Connecticut Path
PO Box 9208

Framingham, MA 01701-9208

508 872-8200, FAX 508 872-0618

SOUTH CENTRAL

Regional Manager/Advertising Sales

ROBERT E. SAWDON

Advertising Sales Assistant

DEBBIE LIVELY

CIO Publishing Inc.

5495 Beltline Road, Suite 240

Dallas, TX 75240

214 239-5736, FAX 214 239-5734

NEW ENGLAND AND CENTRAL

Regional Director/Advertising Sales

LINDA L. BURTON

508 935-4039

CIO Publishing Inc.

492 Old Connecticut Path

PO Box 9208

Framingham, MA 01701-9208

508 872-8200, FAX 508 872-0618

EAST COAST

Regional Director/Advertising Sales

MICHAEL J. MASTERS

Regional Manager/Advertising Sales

FRANK S. GENOVESE

Regional Account Executive

EILEEN TRAPP

Advertising Sales Assistant

KIRSTIN L. PIHL

CIO Publishing Inc.

30 Two Bridges Road, Suite 340

Fairfield, NJ 07004

201 227-1140, FAX 201 227-1565

WEST COAST

Regional Director/Advertising Sales

GERALD E. PARSONS

Regional Manager/Advertising Sales

RICHARD BASTAS

Advertising Sales Assistant

KERRY S. MALLET

CIO Publishing Inc.

220 Montgomery Street, Suite 1120

San Francisco, CA 94104

415 398-8200, FAX 415 398-4649

CIO is a publication of International Data Group, the world's largest publisher of computer-related information and the leading global provider of information services on information technology. International Data Group publishes over 190 computer publications in 61 countries. Thirty million people read one or more International Data Group publications each month. International Data Group's publications include: **ARGENTINA'S** Computerworld Argentina, Infoworld Argentina; **ASIA'S** Computerworld Hong Kong, PC World Hong Kong, Computerworld Southeast Asia, PC World Singapore, Computerworld Malaysia, PC World Malaysia; **AUSTRALIA'S** Computerworld Australia, Australian PC World, Australian Macworld, Network World, Reseller, IDG Sources; **AUSTRIA'S** Computerwelt Oesterreich, PC Test; **BRAZIL'S** Computerworld, Mundo IBM, Mundo Unix, PC World, Publish; **BULGARIA'S** Computerworld Bulgaria, Ediworld, PC World Bulgaria; **CANADA'S** Direct Access, Graduate Computerworld, InfoCanada, Network World Canada; **CHILE'S** Computerworld, Informatica; **COLOMBIA'S** Computerworld Colombia; **CZECH REPUBLIC'S** Computerworld, Elektronika, PC World; **DENMARK'S** CAD/CAM WORLD, Communications World, Computerworld Danmark, Computerworld Focus, Computerworld Uddannelse, LOTUS World, Macintosh Produktkatalog, Macworld Danmark, PC World Danmark, PC World Produktguide, Windows World; **ECUADOR'S** PC World Ecuador; **EGYPT'S** Computerworld Middle East, PC World Middle East; **FINLAND'S** MikroPC, Tietoviikko, Tietoverkko; **FRANCE'S** Distributique, GOLDEN MAC, InfoPC, Languages & Systems, Le Guide du Monde Informatique, Le Monde Informatique, Telecoms & Reseaux; **GERMANY'S** Computerwoche, Computerwoche Focus, Computerwoche Extra, Computerwoche Karriere, edv aspekte, Information Management, Macwelt, Netzwerk, PC Welt, PC Woche, Publish, Unit; **HUNGARY'S** Alaplap, Computerworld SZT, PC World; **INDIA'S** Computers & Communications; **ISRAEL'S** Computerworld Israel, PC World Israel; **ITALY'S** Computerworld Italia, Lotus Magazine, Macworld Italia, Networking Italia, PC World Italia; **JAPAN'S** Computerworld Japan, Macworld Japan, SunWorld Japan; **KENYA'S** East African Computer News; **KOREA'S** Computerworld Korea, Macworld Korea, PC World Korea; **MEXICO'S** Compu Edicion, Compu Manufactura, Computacion/Punto de Venta, Computerworld Mexico, MacWorld, Mundo Unix, PC World, Windows; **THE NETHERLANDS'** Computer! Totaal, LAN Magazine, MacWorld; **NEW ZEALAND'S** Computer Listings, Computerworld New Zealand, New Zealand PC World; **NIGERIA'S** PC World Africa; **NORWAY'S** Computerworld Norge, C/World, Lotusworld Norge, Macworld Norge, Network, PC World Ekspress, PC World Norge, PC World's Product Guide, Publish World, Student Data, Unix World, Windowsworld, IDG Direct Response; **PANAMA'S** PC World Panama; **PERU'S** Computerworld Peru, PC World; **PEOPLE'S REPUBLIC OF CHINA'S** China Computerworld, PC World China, Electronics International, China Network World; **IDG HIGH TECH BEIJING'S** New Product World; **IDG SHENZHEN'S** Computer News Digest; **PHILIPPINES'** Computerworld, PC World; **POLAND'S** Computerworld Poland, PC World/Komputer; **PORTUGAL'S** MacIn; **RUSSIA'S** Computerworld-Moscow, Mir-PC, Sety; **SLOVENIA'S** Monitor Magazine; **SOUTH AFRICA'S** Computing S.A.; **SPAIN'S** Amiga World, Computerworld Espana, Comunicaciones World, Macworld Espana, NeXTWORLD, PC World Espana, Publish, Sunworld; **SWEDEN'S** Attack, ComputerSweden, Corporate Computing, Lokala Natverk/LAN, Lotus World, MAC&PC, Macworld, Mikrodatorn, PC World, Publishing & Design (CAP), Datalingenjoren, Maxi Data, Windows World; **SWITZERLAND'S** Computerworld Schweiz, Macworld Schweiz, PC & Workstation; **TAIWAN'S** Computerworld Taiwan, Global Computer Express, PC World Taiwan; **THAILAND'S** Thai Computerworld; **TURKEY'S** Computerworld Monitor, Macworld Turkiye, PC World Turkiye; **UNITED KINGDOM'S** Lotus Magazine, Macworld, Sunworld; **UNITED STATES'** AmigaWorld, Cable in the Classroom, CD Review, CIO, Computerworld, Desktop Video World, DOS Resource Guide, Electronic News, Federal Computer Week, Federal Integrator, GamePro, inCider/A+, IDG Books, Infoworld, Infoworld Direct, Laser Event, Macworld, Multimedia World, Network World, NeXTWORLD, PC Games, PC Letter, PC World, Publish, Sumeria, SunWorld, SWATPro, Video Event, Video Toaster World; **VENEZUELA'S** Computerworld Venezuela, MicroComputerworld Venezuela; **VIETNAM'S** PC World Vietnam

BUSINESS T O D A Y

The national television series, **BUSINESS TODAY** will explore a broad spectrum of issues in technology, manufacturing and finance. The following will be featured in a show titled,

"SOFTWARE SOLUTIONS FOR PROGRAMMABLE DEVICES"



AT&T MICROELECTRONICS

The ORCA system enables custom silicon chips to be developed in hours rather than months.

**800-372-2447
ext. 194**



Ingres

THE ASK GROUP

INGRES

A leading provider of relational database, application tools and connectivity products world-wide.

800-4-INGRES



ALTARE
COMPUTER SOFTWARE

ALTARE

Job Control Language Management and automation tool . . . Designed to understand JCL and define high-level tasks.

800-5-ALTARE



MOTOROLA

Computer Group

MOTOROLA COMPUTER GROUP

Providers of a full range of VMEbus boards, UNIX-based multiuser systems platforms and realtime systems platforms.

800-759-1107



VG CONTROLS, INC.

Universal Software Configurable Encoder USE145 . . . Turns any keypad into a custom keyboard.

201-853-4600

DATA I/O

DATA I/O

Developers and marketers of software and hardware products for the design of programmable integrated circuits.

800-332-8246

Tune in to **"SOFTWARE SOLUTIONS FOR PROGRAMMABLE DEVICES"** on the Discovery Transponder, August 19, 1993 at 6:41 a.m. Eastern and Pacific Time!

WJMK, Inc. 2424 N. Federal Highway Suite 462 Boca Raton, Florida 33431 (407) 367-0703

Insurance's Loan Ranger

Moving to a more-responsive client/server architecture has proven to be a sound policy for AI Credit Corp.

As a financier of insurance premiums for businesses, New York-based AI Credit Corp. is trying to take advantage of a rapidly growing industry in which the ability to massage up-to-the-minute data can make the difference between a multimillion-dollar deal and no deal at all. Three years ago, management determined that it could not achieve two of its top strategic goals—increased business volume and improved customer service—with the company's 20-year-old mainframe-based information system.

AI Credit brought in BSG Consulting Inc., headquartered in Houston, to help rewrite 11 mission-critical business applications for a Unix-based client/server environment (four front-end applications were completed at the end of 1992; the remaining seven are scheduled to go online by the fourth quarter of 1993). Now users at the company's 10 branch offices have greater access to information and more powerful tools with which to exploit it. This has enabled staff to promptly respond to changes in the marketplace, better serve customers and more quickly create loan packages. Since the system's implementation, AI Credit's business has grown significantly without a corresponding increase in staff.

Before 1992, working up a price quotation involved about a dozen steps. Working from a paper form, analysts crunched the numbers on handheld financial calculators. Complicated or nonstandard quotations were bumped to a special-accounts group. Information about a contract was entered into the mainframe after the contract was actually booked.

The new information system enables analysts to do instant calculations and assess risk for a new account in minutes, said Robert Pigue, assistant vice president and director of information services. A windowing capability makes it easy to move among applications and draw on documents and financial information from many sources. And account executives can handle complicated quotations themselves.

According to Paul Stedman, senior manager for BSG Consulting, the number of steps required to produce a quote for a customer has been cut in half and the time reduced from hours to minutes. Increased responsiveness has translated into competitive advantage. "A number of [companies] selected us...because we've been able to come to the table

with a quote before our competitors," said AI Credit CEO Jerry Vitkauskas. In both of the last two years, the volume of business done by AI Credit has grown by 15 percent, up from 5 percent increases in previous years. This was accomplished with the addition of only two employees to the company's field-operations base of 60. Vitkauskas estimates that the old system would have required the addition of one employee for each percentage point of growth.

The system's lower overhead and the ease with which it can be adapted and changed has also meant a savings in system maintenance and support, according to Pigue.

One unintended benefit of the new system is that all of AI Credit's branch offices now have a unified, standardized approach to doing business. Communication among the widely dispersed branches has been improved, and the company is looking ahead to reorganizing its workflow to use personnel more effectively. In the meantime, AI Credit is doing business not only faster but better.

—Meghan O'Leary and Carol Zarrow

VITAL STATISTICS

Organization: AI Credit Corp., New York

Application: Unix-based client/server network supporting 11 mission-critical business applications

Technologies: Hewlett-Packard HP 9000 running HP/UX and Sybase; Powersoft PowerBuilder application-development platform; Novell NetWare LAN in home office; frame-relay WAN; Advanced Logic Research 486 PCs running Microsoft Windows, Word and Excel, Powersoft Powerpoint and Lotus Notes

Scope: Phase one: pricing and quoting activities. Phase two: credit and portfolio management

Sponsors: CEO Jerry Vitkauskas; CFO Michael Vogen; parent corporation American International Group

Objectives: Gain competitive advantage in an expanding industry by increasing responsiveness to the marketplace; increase business volume while minimizing investment in additional personnel

Payoff: Fifteen percent growth in business volume with only a 3 percent increase in personnel; lower overhead, maintenance and support costs; more cohesive corporate identity

Drive DB2[®] performance

Automatically handle workload swings with **ACTIVITY MANAGER**



Every shot counts during peak usage. You can't afford slow response. You have to deliver the resources to do the job. But you also can't afford to waste those resources when usage subsides.

You no longer have to.

Tune for workloads

BMC Software, Inc. introduces **ACTIVITY MANAGER** — the only integrated solution that automatically matches resource allocations to DB2 workloads — no matter how large or small. While keeping DB2 online.

ACTIVITY MANAGER lets you direct performance, not merely react to it. This approach saves resources and postpones hardware and software upgrades.

ACTIVITY MANAGER includes the integration of two BMC products, **OPERTUNE[®]** and an all-new **ACTIVITY MONITOR**. Through their seamless interface, they are the only products in the industry that provide the most detailed performance information with the ability to automatically and dynamically act *before* performance becomes a problem.

BMC[®]

SOFTWARE

The Experience. The Technology. The Future.

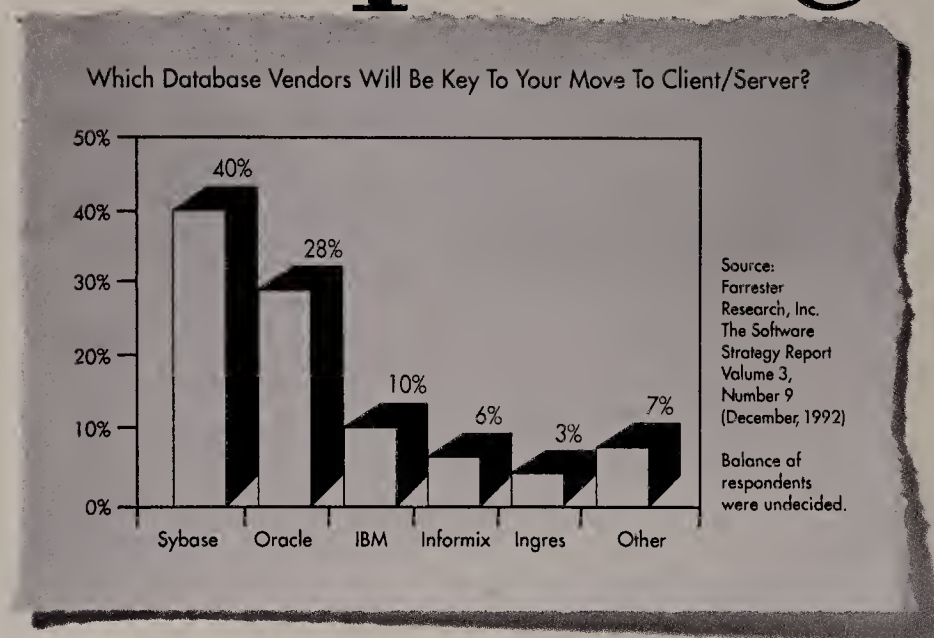
The next step

To extend the power of the **ACTIVITY MANAGER** family, BMC Software will deliver additional, integrated capabilities that reduce I/Os and improve DB2 performance. This future expansion of BMC's performance product family will enable you to dynamically establish and manage cache allocations to help you keep key data within quick reach, without hardware and DB2 upgrades.

BMC is the only vendor to master DB2 performance. For more information, call BMC Software at 713 240-8800 or **1 800 841-2031**.

BMC Software international offices are located in Australia, Canada, Denmark, France, Germany, Italy, Japan, Netherlands, Spain and the United Kingdom. BMC Software is a registered trademark of BMC Software, Inc. DB2 is a registered trademark of IBM Corp. ©1993, BMC Software, Inc. All rights reserved.

The analysts have graphed the future of Client/Server computing.



And they have also spoken.

In recent issues of their ongoing reports, four of the most respected computer industry analysts have taken an unbiased look at Sybase, and its vision of enterprise-wide client/server computing.

They were impressed.



For copies of the full reports from Forrester ResearchTM, Gartner Group, Meta Group and New Science Associates, please call 1-800-8-SYBASE.